Common ARTS

INTERFACE CONTROL DOCUMENT

TABLE OF CONTENTS

Section 1

GENERAL INFORMATION

Section 2

RADAR DISPLAY AND RADAR SYSTEM SELECTOR SWITCh

Section 3

INTERFACILITY INTERFACE

Section 4

SENSOR RECEIVER AND PROCESSOR

Section 8

ARTS PD-PC LAN INTERFACE

Section 9

TRAFFIC MANAGEMENT SYSTEM INTERFACE

Section 10

DIGITAL ALTIMETER SETTING INDICATOR INTERFACE

Section 11

ASR-9 RADAR SYSTEM INTERFACE

Section 12

MODE S BEACON RADAR SYSTEM INTERFACE

Section 13

AIR ROUTE SURVEILLANCE RADAR SYSTEM INTERFACE

Section 14

DECODING DATA ACQUISITION SYSTEM

Section 15

CENTER-TRACON AUTOMATION SYSTEM FINAL APPROACH SPACING TOOL (CTAS/FAST)

Section 16

NOISE MONITORING INTERFACE

Section 17

LOCAL R-ACD INTERFACE

Section 18

REMOTE ARTS COLOR DISPLAY (R-ACD) INTERFACE

Section 19

SURFACE MOVEMENT ADVISORY INTERFACE

Section 20

AIRPORT MOVEMENT AND SURVEILLANCE SYSTEM INTERFACE

Section 21

ATLANTA RESOURCE MANAGEMENT TOOL INTERFACE

Section 22

PRECISION RUNWAY MONITOR INTERFACE

LIST OF ILLUSTRATIONS

LIST OF TABLES

Section 1
GENERAL INFORMATION

1.1 PURPOSE

This Interface Control Document (ICD) defines the external interfaces of the ARTS (ARTS IIIE and ARTS IIE configurations) system Figure 1-1 illustrates the external interfaces. All interfaces are either existing on-site interfaces or standard industry interfaces.

1.2 SCOPE

The external interfaces described in this document consist of the Radar Display/Radar System Selector Switch (RSSS), Air Route Traffic Control Center (ARTCC), Sensor Receiver and Processor (SRAP), Local Digital Bright Radar Indicator Tower Equipment (DBRITE) including the Minimum Safe Altitude Warning (MSAW) alarm, Remote DBRITE, WWVB External Real Time Clock (RTC), the Performance Data PC (PD-PC) Local Area Network (LAN), Traffic Management System (TMS), Digital Altimeter Setting Indicator (DASI) system, Airport Surveillance Radar -9 (ASR-9) Airport Surveillance Radar, Mode-S Beacon radar, the Air Route Surveillance Radar (ARSR) systems, and Decoding Data Acquisition System (DDAS).

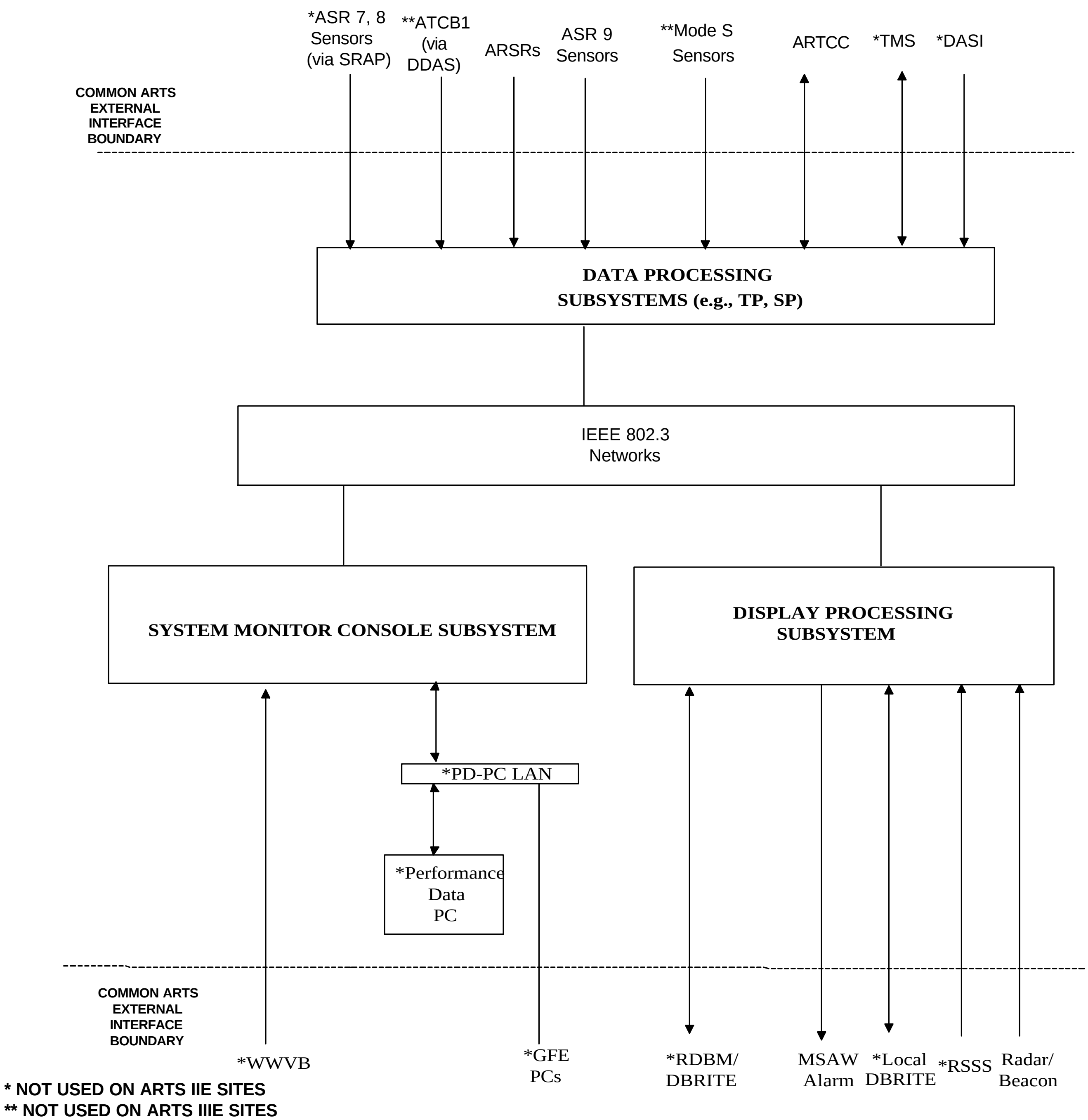


FIGURE 1-1. ARTS EXTERNAL INTERFACES

Section 1Section 2
RADAR DISPLAY AND RADAR SYSTEM SELECTOR SWITCH

2.1 GENERAL DESCRIPTION

The analog signals to the Full Digital ARTS Display (FDAD) are the external interfaces for the ARTS IIIE configuration of ARTS from the radar system. These interfaces are illustrated in Figure 2-1.

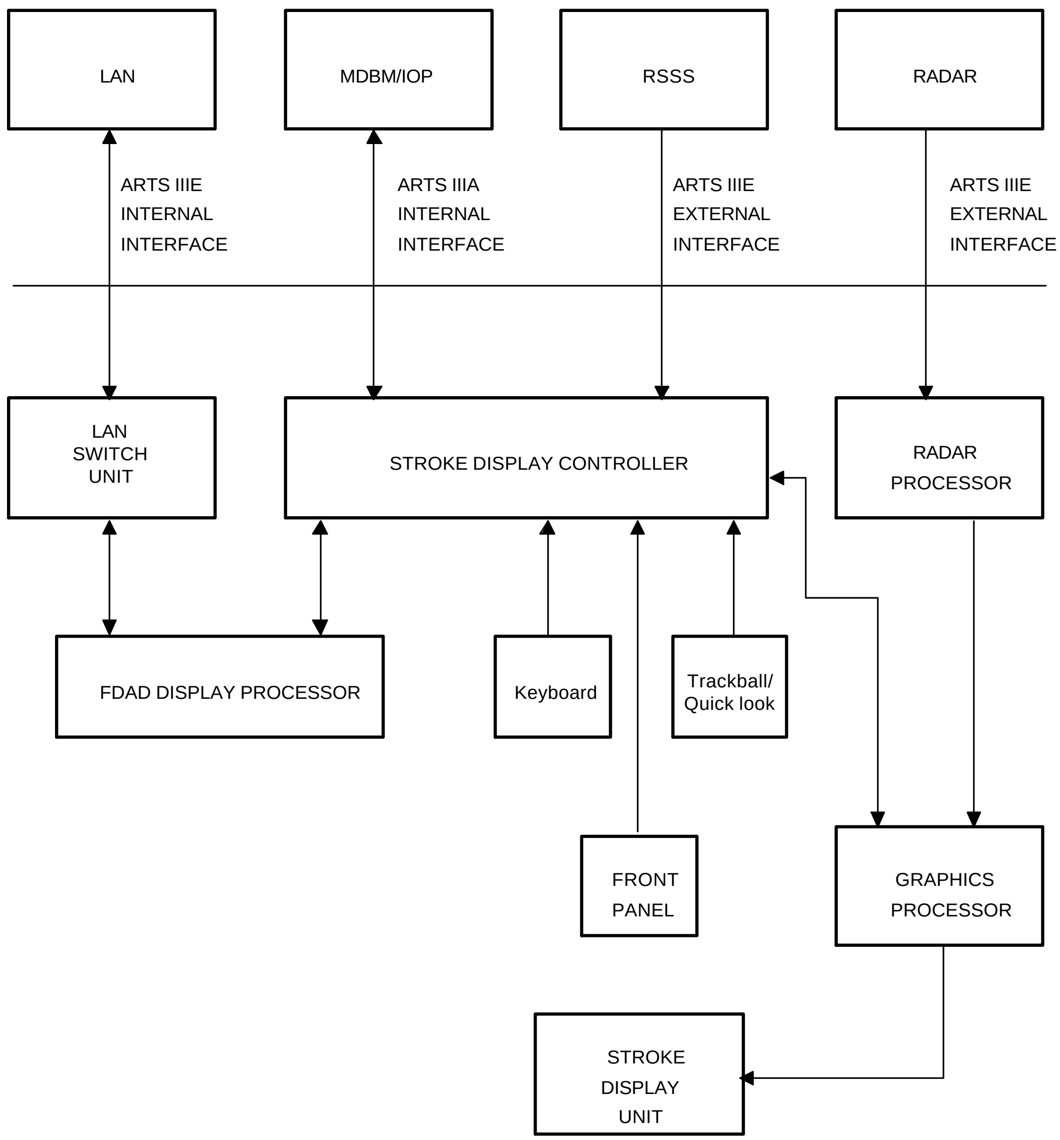


FIGURE 2-1. INTERFACE DIAGRAM - FDAD

2.2 REFERENCED DOCUMENTS

2.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

2.2.1.1 Applicable Government Documents

Specifications

FAA-E-2704 Specification for the ASR-9 Airport Surveillance Radar

FAA-E-2747 New York TRACON Full Digital ARTS Display Technical Specification, 23 January 1989

FAA-TD/S-120-801A Specification for Modular Expandable ARTS III Beacon Level Tracking System

Standards

None.

Other Publications

None.

2.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

None.

Other Publications

ATC 61014 Hardware Top-Level Design Document (CDRL E004)

ATC 61004 System Segment Specification/Hardware Requirements Specification (CDRL E001)

ATC 61041 Hardware Detailed Design Document (CDRL E005)

2.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052 ARTS IIIE Upgrade To Selected Air Traffic Control Facilities, Modification 8, 31 December 1993

FAA Specifications

FAA-E-2759 ARTS IIIE System Functional Specification, 13 August 1993

FAA Computer Program Functional Specifications

None.

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

2.3 RADAR SYSTEM INTERFACE

2.3.1 General Information

The radar system interface consists of normal radar video, moving target indicator (MTI) video, beacon video, map video, a spare video input (e.g., could be ASR-9 weather data), pretrigger signals, and azimuth information. The azimuth information consists of Azimuth Change Pulses (ACPs) and Azimuth Reference Pulses (ARPs). Standard beacon video and video from the Sensor Receiver and Processor (SRAP) are switch selectable by the Beacon Analog switch on the front panel of the FDAD.

2.3.2 Mechanical Characteristics

The Common ARTS IIIE configuration external interface connectors are located at the rear of the FDAD console. The radar video, both normal and MTI, beacon video, map video, and pretrigger signals enter the FDAD console at the rear via coaxial cable and BNC connectors. In addition, the ACPs and ARPs enter at the rear of the console with coaxial cabling and BNC connectors. Table 2-1 lists and Figure 2-2 illustrates all the connectors on the rear panel of the FDAD. Connectors 1J1 and 1J3 through 1J12 are part of the external interface. Connector 1J2, test video output connector, is an interface internal to the ARTS IIIE.

2.3.3 Electrical Characteristics

The radar system interface signal characteristics of the ACPs, ARPs, and the broadband video are specified in FAA-TD/S-120-801A and the ASR-9 specification FAA-E-2704. The ASR-9 radar interface is identical to the existing radar sensors.

TABLE 2-1. FDAD REAR PANEL CONNECTORS

DESIGNATION	NAME
1J1	RSSS
1J2	Test Video Output
1J3	Map Video
1J4	Normal Video
1J5	MTI Video
1J6	Spare Video*
1J7	Beacon Video
1J8	Beacon Data Acquisition Subsystem (BDAS) Video
1J9	Spare
1J10	ACP
1J11	ARP
1J12	Radar Pretrigger (RPT)
1J13	Not Used
1J14	Not Used
1J15	Maintenance Power Output
1J16	Power Input
1J17	System Ground
1A4A1J2	Trunk A Operational Network
1A4A1J4	Trunk B Operational Network
1A4A1J3	Trunk A Maintenance Network
1A4A1J5	Trunk B Maintenance Network
1J18	ARTS IIIA Input Data
1J19	ARTS IIIA Output Data
1J20	Not Used

* Can be used for ASR-9 weather data

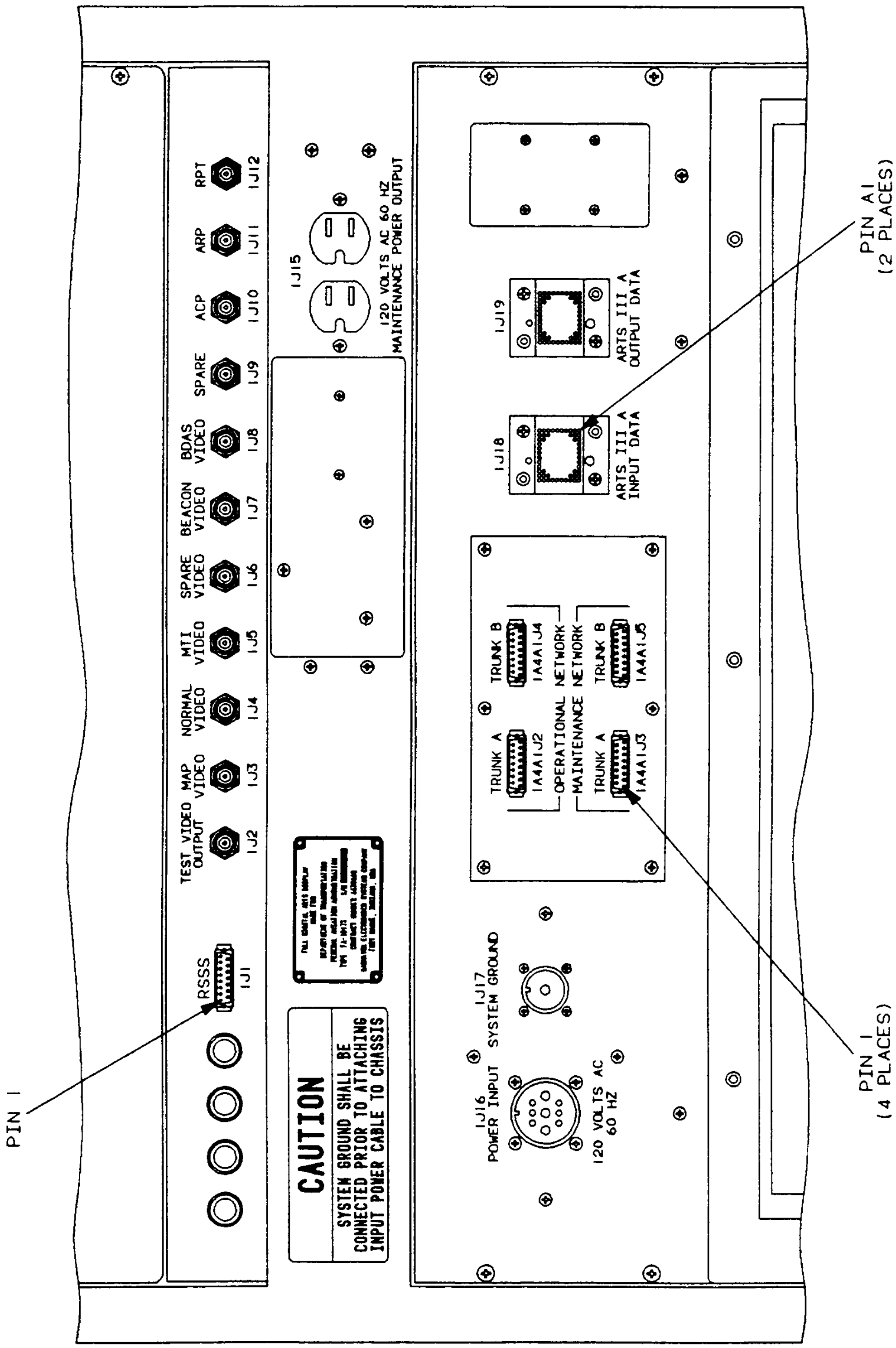


FIGURE 2-2. FDAD CONNECTOR PANEL

2.3.3.1 Azimuth Data Inputs

ACPs and ARPs, distributed by the Surveillance and Communications Interface Processor (SCIP), are accepted from either the Azimuth Pulse Generator (APG) or the Azimuth Distribution Unit (ADU) via the Radar/ARTS Interface Matrix Racks. One antenna head rotation (360°) consists of 4096 equally spaced ACPs and one ARP. The ARP is positioned to fall within ±20 percent of the ACP interval from the midpoint between the 4096th ACP of one radar scan and the first ACP of the next radar scan. The electrical characteristics of ACPs and ARPs are as follows:

1. APG Interface

Pulse Shape:	Approximately sinusoidal
Amplitude:	5±1 Volt peak-to-peak
Jitter:	ACP: 10% of nominal spacing
	ARP: 20% of ACP spacing
Source Impedance:	91 ohms (coax)

2. ADU Interface

Logic 0:	0 to 0.5 Vdc
Logic 1:	5.0 ±1 Vdc
Pulse Width:	23 ±3 microseconds
Pulse Rise Time:	1.0 microsecond (max)
Pulse Decay Time:	1.0 microsecond (max)
Jitter:	ACP: 10% of nominal spacing
	ARP: 10% of nominal spacing
Source Impedance:	91 ohms (coax)

2.3.3.2 Radar Inputs

Analog radar inputs (video) are as follows:

1. Radar Pretrigger

Pulse Amplitude:	4 to 85 volts (+)
Source Impedance:	91 ohm (coax)
Pulse Width:	0.5 to 2.0 msec
Pulse Rise Time:	0.01 to 0.1 msec
Pulse Fall Time:	0.01 to 0.4 msec
Pulse Repetition Frequency:	700 to 1500 pulses/second
Timing Sequence:	20 to 200 msec prior to radar trigger or radar zero range

2. Normal Video (analog)

Video Level:	0.5 to 6 volts (+)
Source Impedance:	91 ohm (coax)
Video Pulse Width: (Isolated Target)	0.5 to 1500 msec
Video Rise Time: (Isolated Target)	0.1 ±0.01 msec
Video Fall Time:	0.1 ±0.03 msec
Thermal Noise Level:	250 mV mean peak
Minimum Discernible Signal:	-110 dBm (typical)

3. MTI Video (Analog)

Video Level:	0.5 to 6 volts (+)
Source Impedance	91 ohm (coax)
Video Pulse Width: (Isolated Target)	0.5 to 6.5 msec
Video Rise Time: (Isolated Target)	0.1 ±0.01 msec
Video Fall Time:	0.1 ±0.02 msec
Thermal Noise:	250 mV mean peak
Minimum Discernible Signal:	-108 dBm (typical)

2.3.3.3 Beacon Inputs

Beacon inputs (video) are as follows:

Amplitude:	1V to 4V. Voltage protection shall be incorporated to prevent damage from video amplitudes as high as 50V
Rise Time:	0.05 to 0.15 msec
Fall Time:	0.10 to 0.25 msec
Pulse Width:	0.35 to 0.60 msec
Noise Level (max):	0.5V peak
Source Impedance:	91 ohms (coax)

2.4 RADAR SYSTEM SELECTOR SWITCH INTERFACE

2.4.1 General Information

The FDAD is interfaced to a broadband RSSS panel located at the controller position. Three logic lines permit selection of up to seven radar sensors.

2.4.2 Mechanical Characteristics

The three logic level lines and grounds enter the FDAD console via a 15-pin D-subminiature connector at the rear of the console. Pin numbers and signal names are shown in Figure 2-3.

2.4.3 Electrical Characteristics

The RSSS switch provides three sets of open or closed contacts to specify the radar sensor providing broadband video to the display. A closed contact (ground) represents a binary zero and an open a binary one. NOTE: (All ones are illegal in software) (see Table 2-2).

2.4.4 Protocol

Not applicable.

2.4.5 Data Format

The RSSS at the controller position is a multi-sensor switch interface. A three-bit digital code indicates which area surveillance radar has been selected for a given console (see Table 2-2). The codes received indicate the selected radar input.

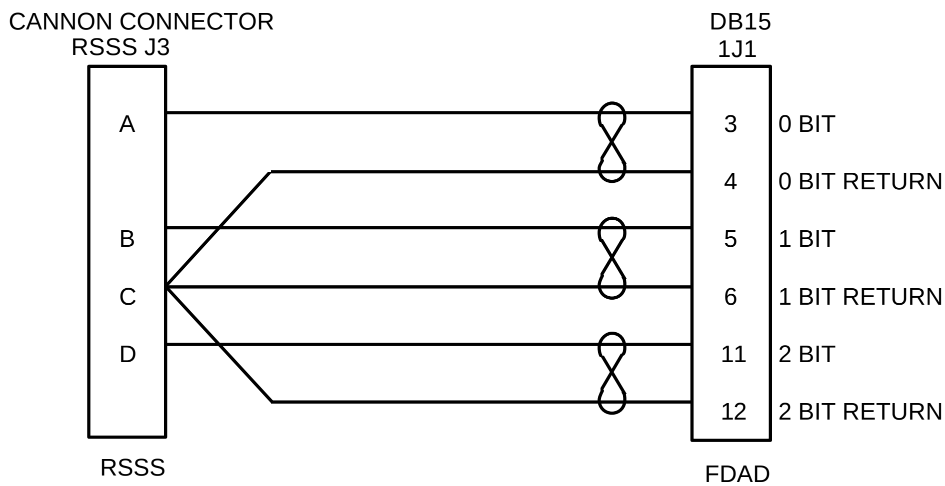


FIGURE 2-3. RSSS EXTERNAL INTERFACE CABLE

TABLE 2-2. SENSOR CODE NUMBERS

CODE NUMBER	SENSOR
000	Sensor 00
001	Sensor 01
010	Sensor 02
011	Sensor 03
100	Sensor 04
101	Sensor 05
110	Sensor 06
111	Illegal 07

Section 3
INTERFACILITY INTERFACE

3.1 GENERAL DESCRIPTION

The interfacility interface is the external interface between the ARTS and the Air Route Traffic Control Center (ARTCC). The block diagram of the ARTS IIIE interfacility interface is shown in Figure 3-1 and Figures 3-2 and 3-3 show the ARTS IIE interfacility interface. The interfacility interface is implemented using a serial interface to the ARTS system. The interfacility interface ARTS software is described in NAS-MD-631, NAS En Route Common ARTS, and NAS-MD-640, Interfacility Data Transfer.

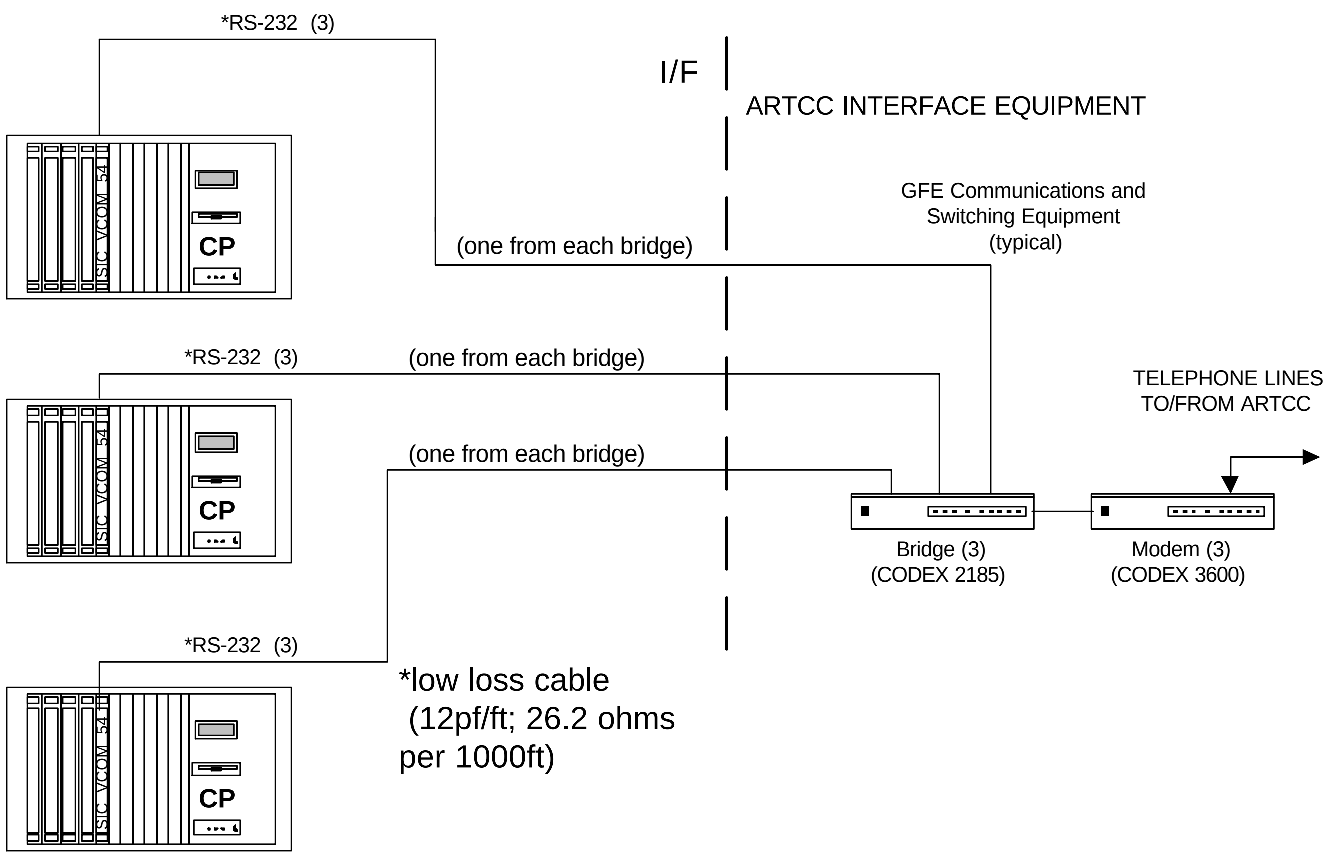


FIGURE 3-1. ARTS IIIE TO ARTCC INTERFACILITY INTERFACE

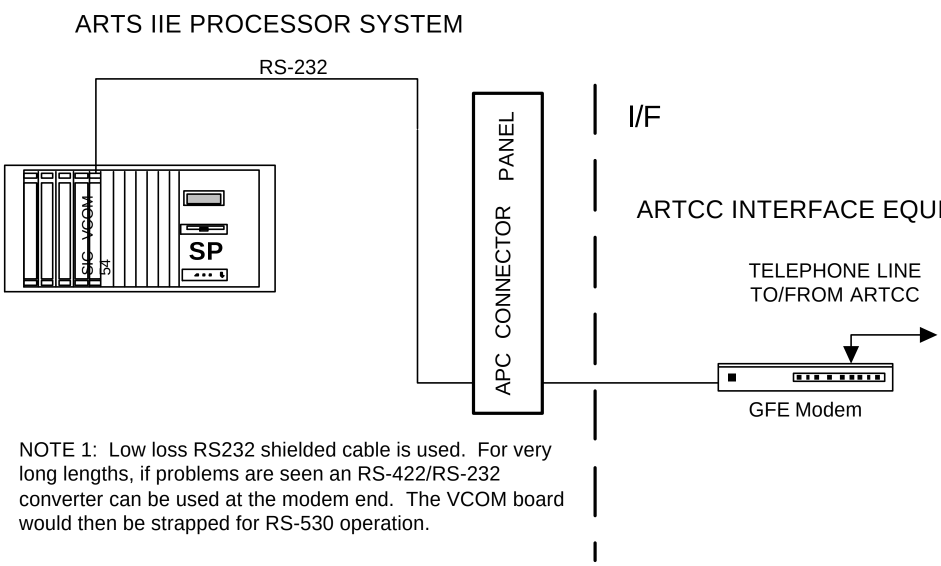


FIGURE 3-2. ARTS IIE TO ARTCC INTERFACILITY INTERFACE

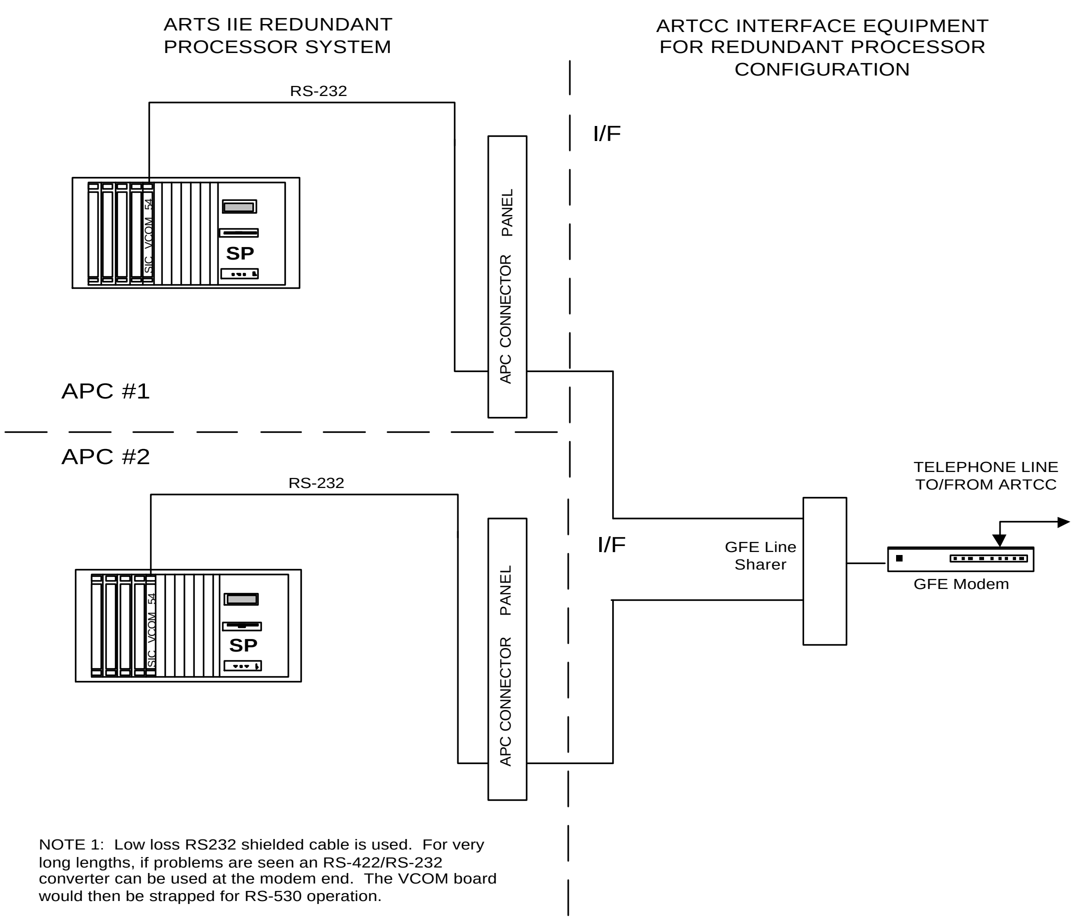


FIGURE 3-3. DUAL ARTS IIE TO ARTCC INTERFACILITY INTERFACE

3.2 REFERENCED DOCUMENTS

3.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

3.2.1.1 Applicable Government Documents

Specifications

None.

Standards

None.

Other Publications

None.

3.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

EIA-RS-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Exchange
EIA-RS-422-A	Electrical Characteristics of Balanced Voltage Digital Interface Circuits, December 1978
EIA-RS-449	General Purpose 37-Position and 9-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange, January 1978 (Reaffirmed)
EIA-TIA-530-A	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Including Alternative 26-Position Connector (ANSI/TIA-530-A-92), June 1992

Other Publications

None.

3.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052	ARTS IIIE Upgrade To Selected Air Traffic Control Facilities, Modification 8, 31 December 1993
DTFA01-90-C-00057	ARTS IIA Interim Support Program for Air Traffic Control Facilities

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993
FAA-E-2570d	Automated Radar Terminal Air Traffic Control System ARTS IIA (draft)
FAA-E-2217	AMENDMENT-4 2400 Bit-Per-Second Data Set Equipment Superseding Digital Data Communications System (DACOM), 30 October 1987

FAA Computer Program Functional Specifications

NAS-MD-631	En Route - ARTS
NAS-MD-640	Interfacility Data Transfer

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

3.3 INTERFACILITY INTERFACE DESCRIPTION

3.3.1 General Information

The interface with the ARTCC via the GFE Communications and Switching Equipment for the ARTS IIIE system consists of RS-232 low loss cable to a BT7-ITM24 interface board and then to the VCOM 54 serial input/output controller, both located in the Common Processor (CP). The interface with the ARTCC via the GFE Communications and Switching Equipment for the ARTS IIE is also via low loss RS-232 cable to a BT7-ITM24 interface board and then to the VCOM 54 serial input/output controller, both located in the System Processor (SP). The interface capabilities of each of the ARTS IIIE CPs will provide for up to three RS-232 serial interfaces from the GFE. This interface for the ARTS IIE implementation has one interface to the ARTCC. If a dual SP configuration is used for the ARTS IIE system, then each SP has an interface to the ARTCC through GFE communication and switching equipment.

Low loss RS-232 cable allows the length to exceed 50 feet, bypassing the junction box and eliminating the interface converter at the modem equipment.

3.3.2 Mechanical Characteristics

Table 3-1 defines the pinout for the GFE equipment to converters, if used, in the standard RS-232 cable. Table 3-1A shows the low loss RS-232 COTS interfacility cable configuration.

TABLE 3-1. GFE EQUIPMENT TO CONVERTERS

CONVERTER PIN (DTE)	FUNCTION	GFE EQUIPMENT (DCE)
1	Protective Ground (SG)	1
2	Transmit Data (BA)	2
3	Receive Data (BB)	3
4	Request to Send (CA)	4
5	Clear to Send (CB)	5
7	Signal Ground (AB)	7
15	Transmit Clock (DB)	15
17	Receive Clock (DD)	17

TABLE 3-1A. W250 LOW LOSS RS232 COTS INTERFACILITY CABLE 7922053/7922054

DTE APC External Connector Panel (J1) - pin	Signal Name	Used	DCE GFE Modem Pin	From
1	Shield Ground	X	1	
2	Transmit Data	X	2	APC
3	Receive Data	X	3	Modem
4	Request to Send	X	4	APC
5	Clear to Send	X	5	Modem
6	DCE ready		6	
7	Signal Ground	X	7	
8	Rcvd line signal detect		8	
9	+Voltage		9	
10	-Voltage		10	
11			11	
12	secondary Rcvd line signal detect		12	
13	secondary Clear to Send		13	
14	secondary Transmit Data		14	

15	Transmit Clock	X	15	Modem
16	secondary Receive Data		16	
17	Receive Clock	X	17	Modem
18	Local Loopback		18	
19	Secondary Request to Send		19	
20	DTE Ready		20	
21	Remote Loopback		21	
22	Ring Indicator		22	
23	Data Signal Rate Selector		23	
24	DTE Transmit Signal Element Timing		24	
25	Test Mode		25	

3.3.3 Electrical Characteristics

Signal levels of marking and spacing for data and control from the GFE communications equipment are as specified in EIA RS-232 Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange.

3.3.4 Protocol

The protocol between ARTS and the interfacility GFE communications and switching equipment is based on the EIA-RS-232 serial communications interface under software control. All timing for this interface is provided by the GFE side of the interface. The receive clock as well as the transmit clock originate at the GFE Communications and Switching Equipment for data timing. The Request to Send signal originates from the ARTS side of the interface. This signal, when activated, is sent on all three serial channels. Control is maintained by the detection and decoding of a synchronization word. This word is used both for synchronization and a Start of Message (SOM) on the serial interface. Message quality control is maintained on the data by a Longitudinal Redundancy Check (LRC). The signals used by this protocol are listed in Table 3-2.

TABLE 3-2. INTERFACILITY INTERFACE SIGNALS

SIGNAL	EIA-RS-232 IDENTIFIER	SOURCE
Transmit Data	BA	ARTS
Transmit Data Clock	DB	GFE Communications and Switching Equipment
Receive Data	BB	GFE Communications and Switching Equipment
Receive Data Clock	DD	GFE Communications and Switching Equipment
Request to Send	CA	ARTS
Clear to Send	CB	GFE Communications and Switching Equipment

Channel idle means that either the ARTCC or the ARTS side of the interface is transmitting an idle code of alternate ones (1's) and zeros (0's) illustrated in Figure 3-3.

If the ARTCC senses alternate ones (1's) and zeros (0’s), the ARTS system is sending idle code and no data is being transferred. If the ARTS system senses alternate ones (1's) and zeros (0's), the ARTCC system is sending idle code and no data is being transferred.

Channel inactive means that either the ARTCC or the ARTS side of the interface is transmitting a constant level of a binary one or zero.

Channel active means that either the ARTCC or the ARTS side of the interface is transmitting a synchronization code of 17 or 18 zeros followed by a one bit as illustrated in Figure 3-3. Upon recognition of a sync code, that active channel transmits a ten character code (10 bytes) for the Source Identification (SOURCE ID) which is followed by a field separator of a space (1 byte). After the field separator is transmitted, the transmitting side of the interface will send two bytes: 1) an LRC prepare code (10110011) (1 byte) which identifies the next byte as the LRC; 2) an LRC (1 byte). The message data follows for the desired message type (NAS-MD-640). At the end of the message data, a second LRC is generated and transmitted. Following this LRC, the End of Message (EOM) code (10110001) is generated and transmitted.

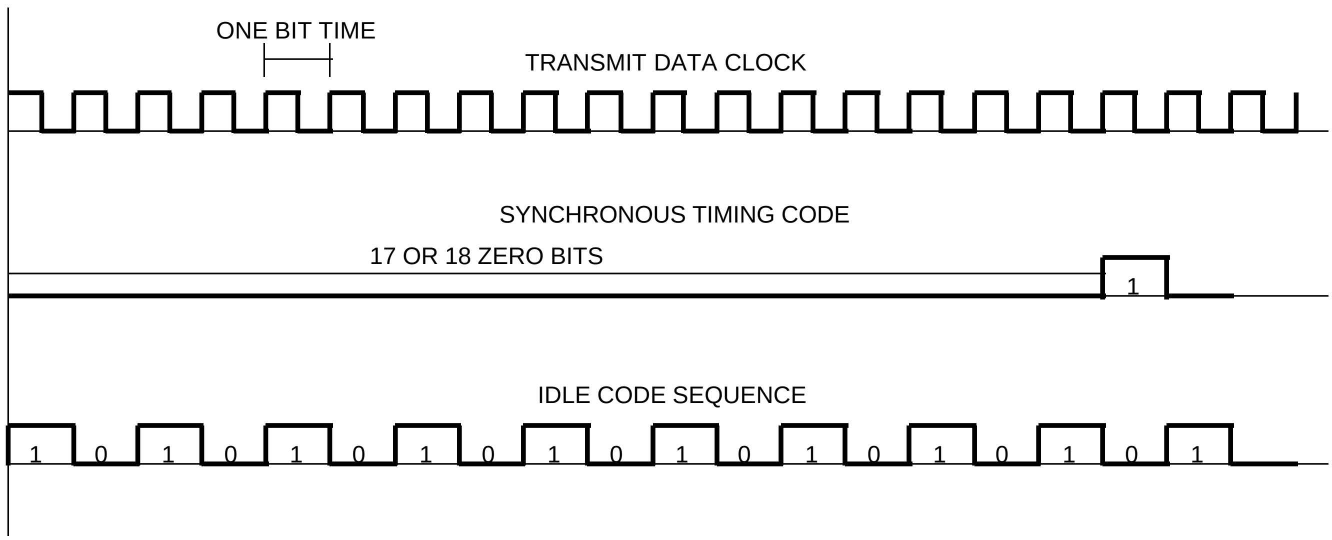


FIGURE 3-3. INTERFACILITY SIGNALS

3.3.5 Data Formats

The interfacility data transfer is described in NAS-MD-640. Format of the messages transferred between facilities is also described in the Interface Control Document, NAS-MD-631, NAS En Route ARTS.

Section 4
SENSOR RECEIVER AND PROCESSOR

4.1 GENERAL DESCRIPTION

The Sensor Receiver and Processor (SRAP) interface is an external interface of the ARTS IIIE configuration of the ARTS system. Figure 4-1 illustrates an overall view of the SRAP interface.

The SRAP parallel interface is not modified. The existing SRAP parallel interface is described PX 12104, SRAP Technical Manual, Volume 1, Section 1, and Section 4, paragraph 4-2.b (2)(b). Those documents remain unchanged and the following discussions of the SRAP parallel interface are provided for information purposes.

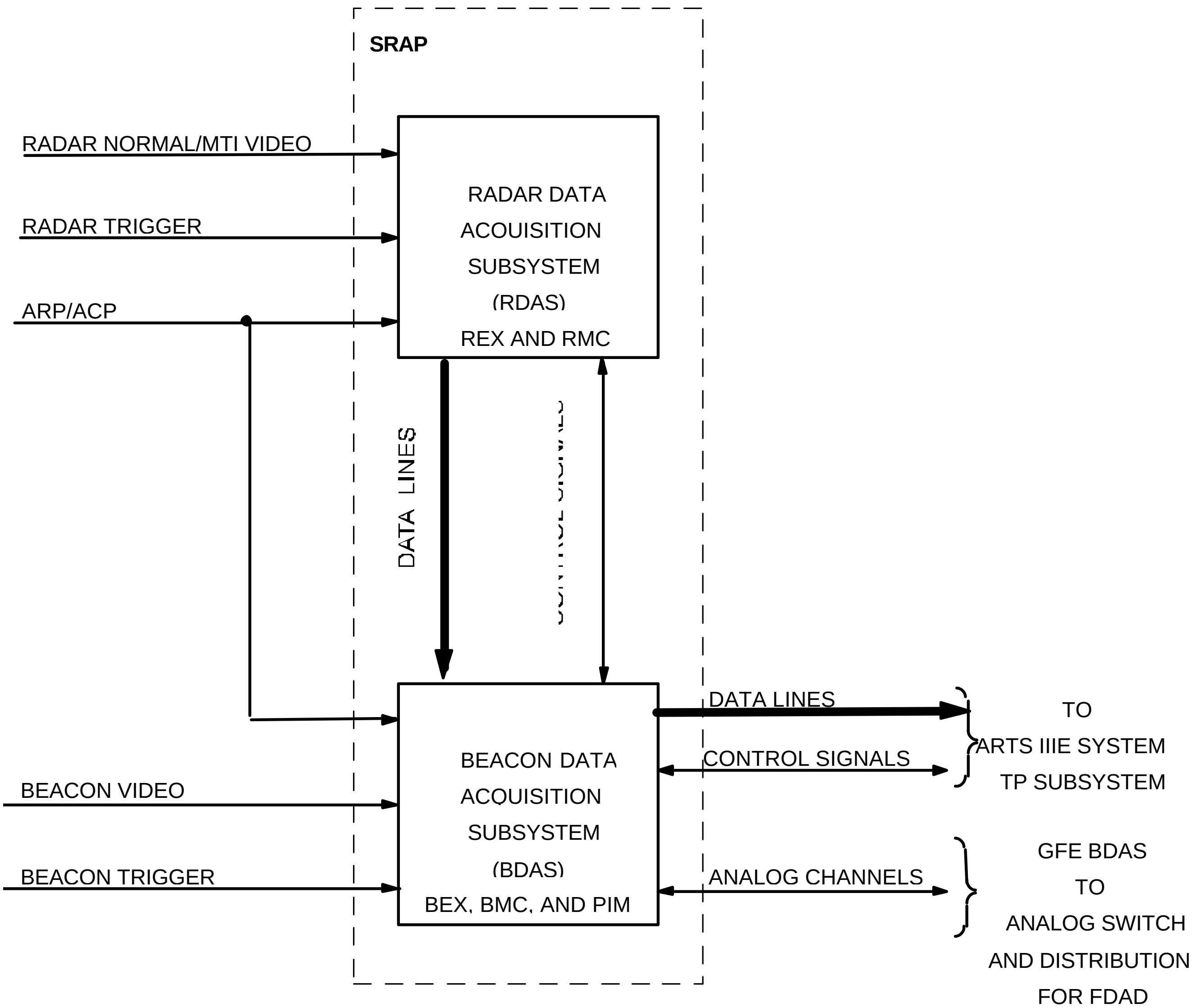


FIGURE 4-1. SRAP OVERALL BLOCK DIAGRAM

4.2 REFERENCED DOCUMENTS

4.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

4.2.1.1 Applicable Government Documents

Specifications

FAA-E-2747	New York TRACON Full Digital ARTS Display Technical Specification, 23 January 1989

Standards

None.

Other Publications

None.

4.2.1.2 Applicable Non-Government Documents

Specifications

SB-10205	Input/Output Channel Characteristics Input/Output Processor (IOP)

Standards

None.

Other Publications

ATC 21000	ATC Hardware Design Data, paragraphs 3.2.1 and 3.2.2
ATC 21003	Design Specification for the Sensor Receiver and Processor, paragraphs 3.4.1 and 3.4.2
PX 12104-1-1	Technical Manual for Sensor Receiver and Processor (SRAP), Volume 1, Sections 1, 2, and 4

4.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052	ARTS IIIE Upgrade To Selected Air Traffic Control Facilities, Modification 8, 31 December 1993

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993

FAA Computer Program Functional Specifications

None.

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

4.3 SENSOR RECEIVER AND PROCESSOR INTERFACE DESCRIPTION

4.3.1 General Information

The SRAP consists of two units: the Radar Data Acquisition Subsystem (RDAS) and the Beacon Data Acquisition Subsystem (BDAS). A subsystem can be configured with a single unit, one of each type, or a dual SRAP with two of each type.

The RDAS detects and transfers aircraft targets and, optionally, weather data derived from search radar video returns. The BDAS provides detection and transfer of aircraft target data derived from the beacon transponder, correlates merging of radar and beacon target report data, and sends the merged data to the ARTS system.

The Radar Extractor (REX) receives video and a pretrigger from the primary radar, and ACP and ARP from the Azimuth Pulse Generator (APG) or Azimuth Distribution Unit (ADU). Analog-to-digital converters convert the normal and Moving Target Indicator (MTI) video into usable digital formats. The ACPs, ARPs, and pretriggers are used to synchronize the REX circuits with the radar's azimuth and range values. Output data transmitted to the Radar Micro-Controller (RMC) includes a report for each detected target, an azimuth count transmitted once each sweep, clutter sum data, weather if enabled, and alarm messages.

Input data received from the RMC includes clutter map data used for normal or MTI video selection, and REX parameter and control settings. The RMC processes target, azimuth, clutter, and alarm words developed by the REX and generates output messages. The message types are target reports, alarm words, weather map (switch selectable), and sector mark messages. These messages are stored for subsequent use by the BDAS. The RDAS is shown in Figure 4-2.

The BDAS consists of a hardware Beacon Extractor (BEX) and a Beacon Microprogrammed Controller (BMC). The BEX receives beacon video and trigger signals from the secondary radar. ACPs and ARPs are received from the APG or the ADU. The BEX detects beacon transponder replies from the beacon video and sends associated code and range data to the BMC along with azimuth, mode, and alarm data. The BMC processes the azimuth, range, code, and alarm words from the BEX and generates a beacon target report that includes range, azimuth, code, and altitude data; an alarm message that provides status data; and a sector mark message. These messages are stored along with the messages received from RDAS and the BMC attempts to merge radar and beacon target data. If ranges and azimuths correlate within the bounds of preset minimums, the reports are merged. The results of correlation attempts are placed in the output queue to the ARTS system as radar only, beacon only, or merged targets. The BDAS is shown in Figure 4-3.

The Parallel Interface Module (PIM) in the BDAS provides a parallel data interface between the BDAS and the ARTS Sensor Gateway. The existing ARTS IIIE Network Interface Adapters (NIAs) are simply reprogrammed (i.e., no changes are planned or required to the NIA hardware) to provide the Sensor Gateway function for SRAP data. The PIM accepts 12-bit data words from the BDAS in SRAP and assembles these data words into 30-bit data words for transmission to the Sensor Gateway. The PIM/Sensor Gateway interface conforms to a type A channel interface.

4.3.2 Mechanical Characteristics

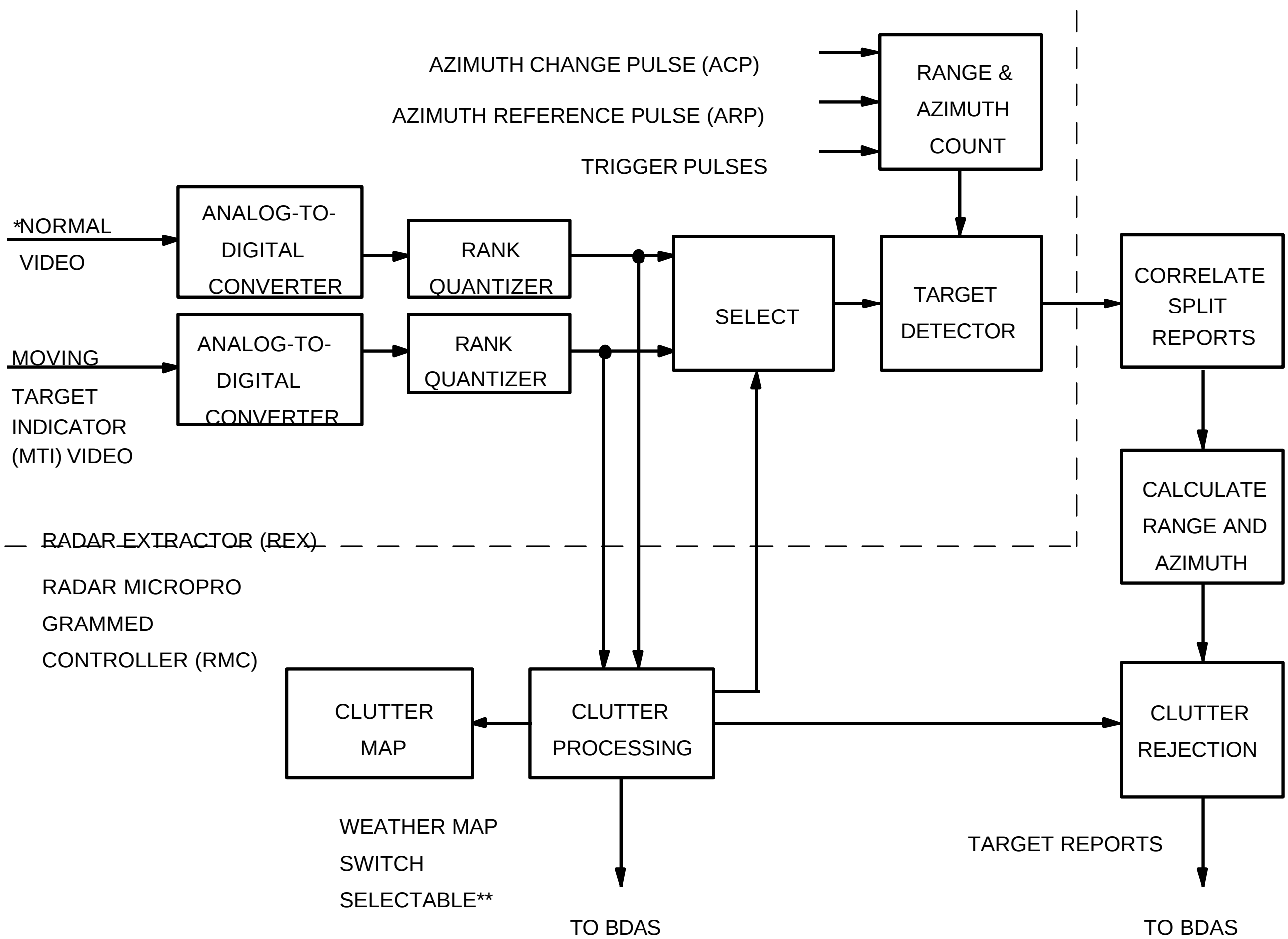
The I/O connector panel for the SRAP is located on the top surface of the cabinet. Female, coaxial, BNC connectors are provided for video, triggers, and azimuth pulses. Connectors (120-pin) are provided for parallel data cables. The I/O connector panel for the SRAP is shown in Figure 4-4. Cabling for a dual SRAP configuration is shown in Figure 4-5.

Type A channel 120-pin connector assignments are shown in Table 4-1.

4.3.3 Electrical Characteristics

4.3.3.1 Type A Interface

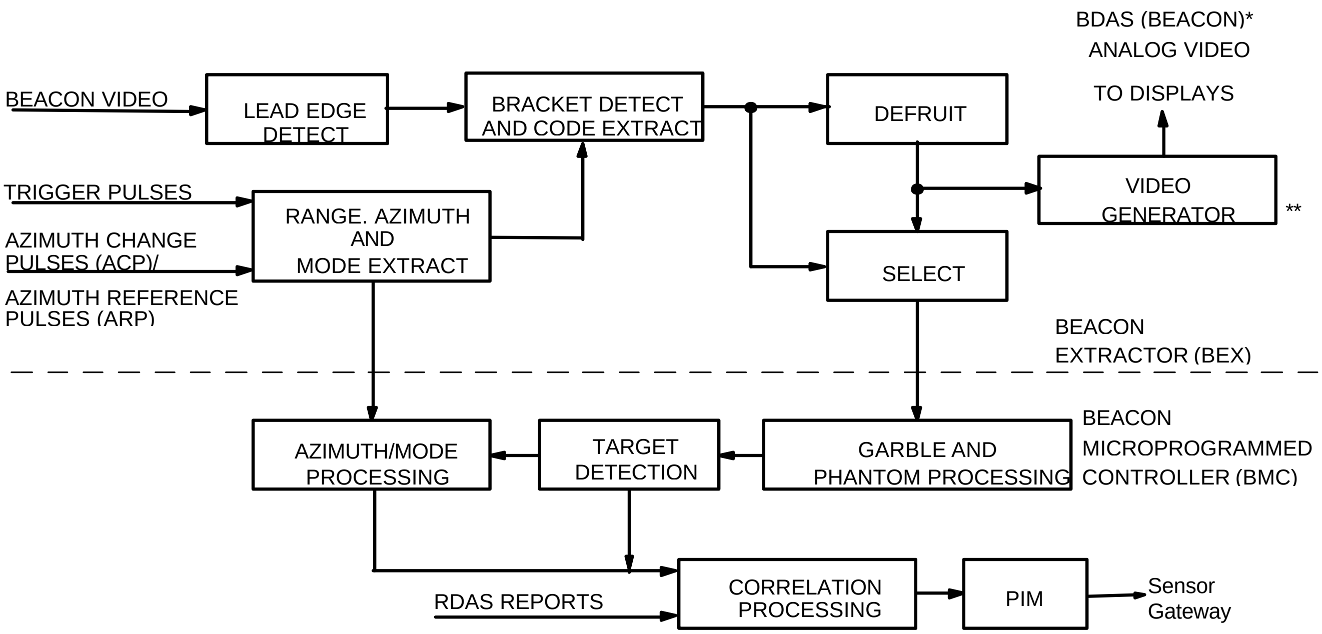
Type A interface is characterized by nominal values of 0 and -3 volts to represent the binary one and zero states, respectively. The electrical characteristics are specified in the following subparagraphs:



*REFER TO SECTION 2, PARAGRAPH 2.3.3 FOR SIGNAL DEFINITION.

**THE EXACT MESSAGE TYPES ARE DEFINED IN SECTION 4, PARAGRAPH 4.3.5.

FIGURE 4-2. RADAR DATA ACQUISITION SUBSYSTEM



*REFER TO SECTION 2, PARAGRAPH 2.3.3 FOR SIGNAL DEFINITION.
**THIS IS USED FOR MAINTENANCE.

FIGURE 4-3. BEACON DATA ACQUISITION SUBSYSTEM

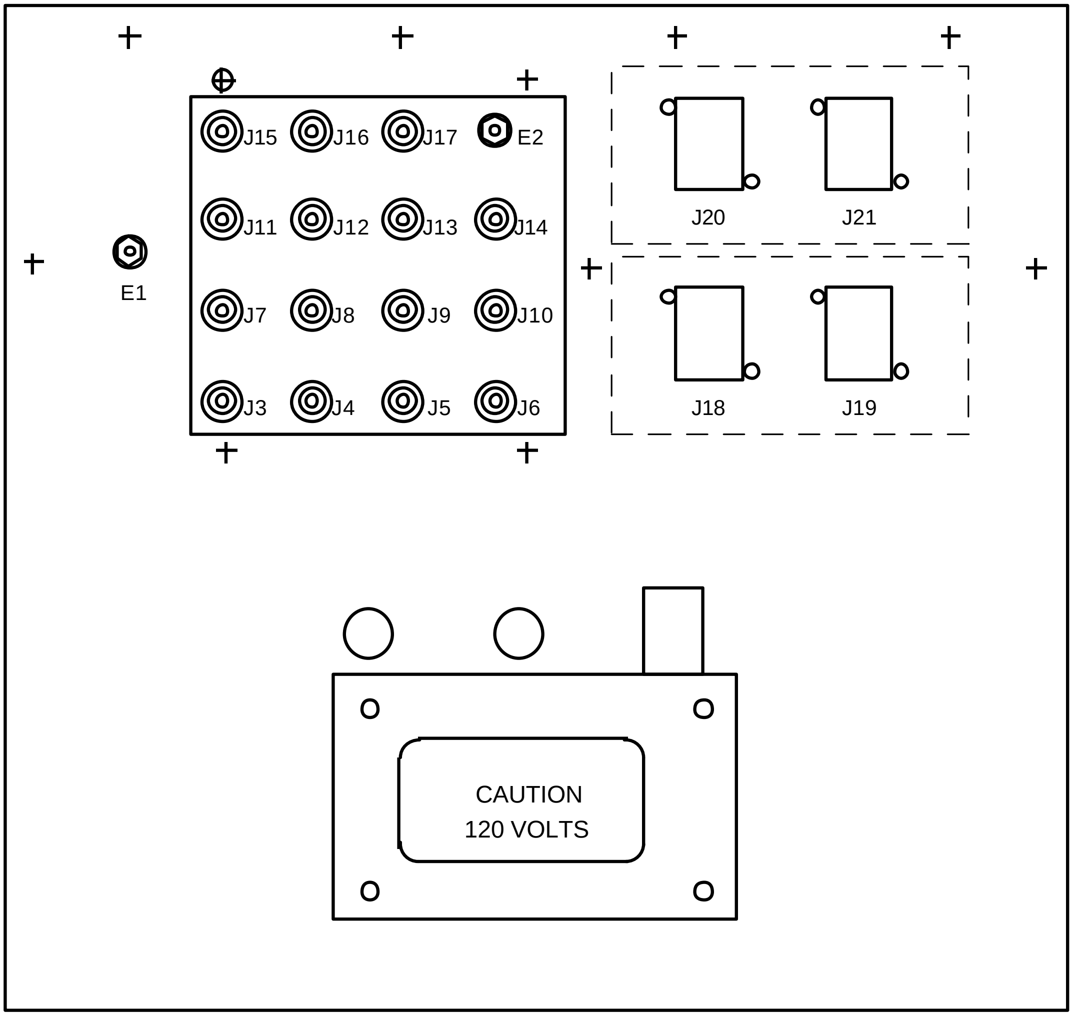
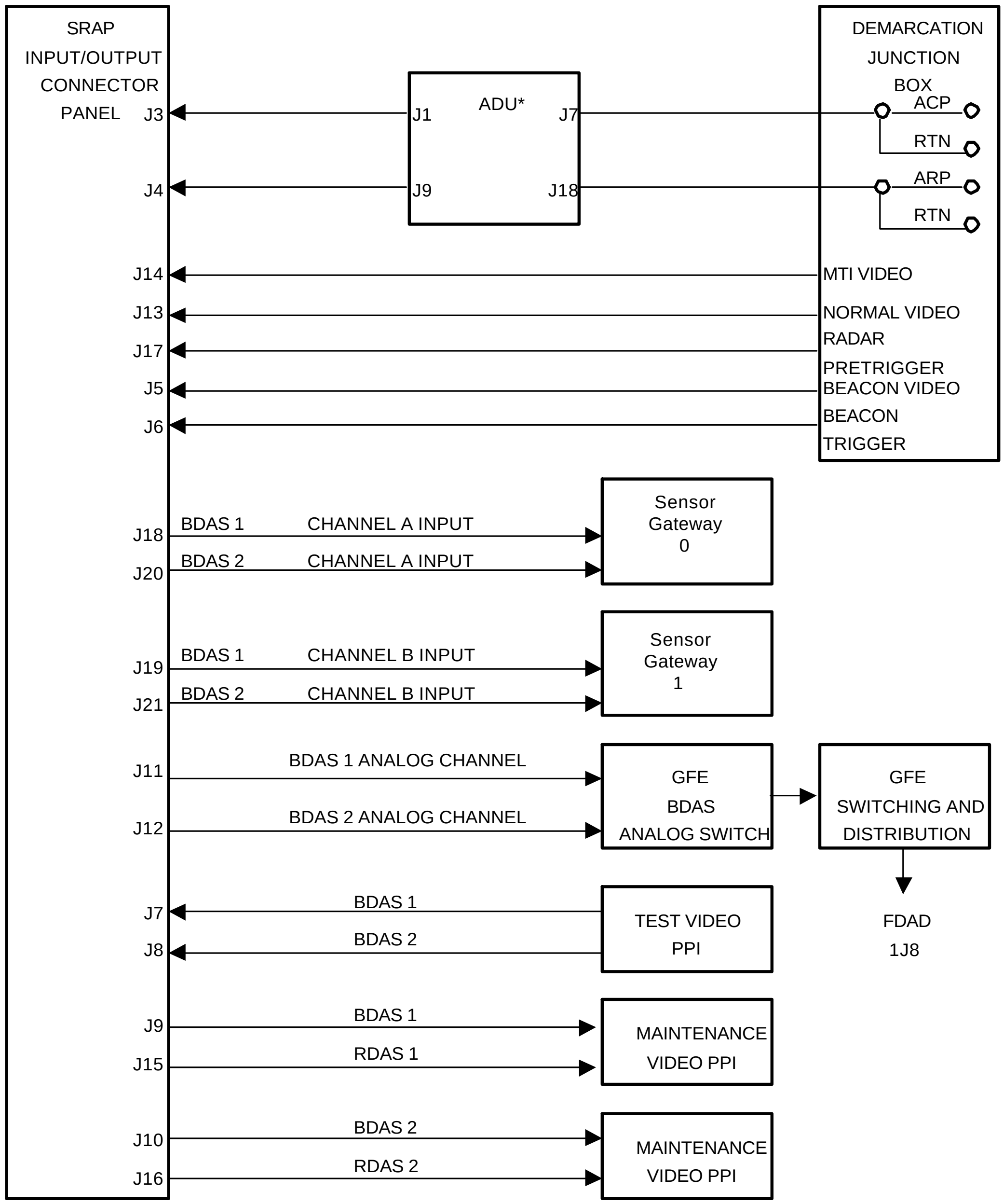


FIGURE 4-4. SRAP I/O CONNECTOR PANEL



*ADU CAN BE USED WITH RADARS SUCH AS THE ASR-4, 5, 6, 7 AND 8

FIGURE 4-5. DUAL SRAP EXTERNAL CABLING

TABLE 4-1. CONNECTOR PIN ASSIGNMENTS, TYPE A CHANNELS

*SIGNAL	RETURN	INPUT CHANNEL CONNECTOR
B1	-	Shield Ground
B3	A3	Lower Half-Word Parity
B4	A4	Upper Half-Word Parity
B5	A5	Input Data Request
B6	A6	Input Data Acknowledge
B7	A7	External Interrupt Request
B8	A8	External Interrupt Enable
D1	C1	Data Bit 0
D12	C12	Data Bit 11
G1	H1	Data Bit 12
G12	H12	Data Bit 23
J1	K1	Data Bit 24
J6	K6	Data Bit 29

*Each signal and the corresponding return, except shield ground, require a twisted pair.

Type A input amplifier - Each Type A input amplifier circuit has the following characteristics:

1. The maximum steady state current drawn from a line by an input circuit does not exceed 21 milliamperes when the input is between zero volt and -0.5 volt.
2. The input circuit is such that if the input wire is disconnected, the effect will be as though a zero were present at the input.
3. The threshold level distinguishing the one state is a voltage level at the input more positive than -1.1 volts. The threshold level distinguishing a zero state is more negative than -2.5 volts.
4. The equivalent circuit as seen across the input line is as specified in Figure 4-6. The signal is transmitted through twisted pair and terminated in a 160-ohm impedance differential amplifier for common mode noise rejection.
5. External equipment resynchronizes all control signals (i.e., signals other than data) by sensing the control signal transition from the zero to the one state.

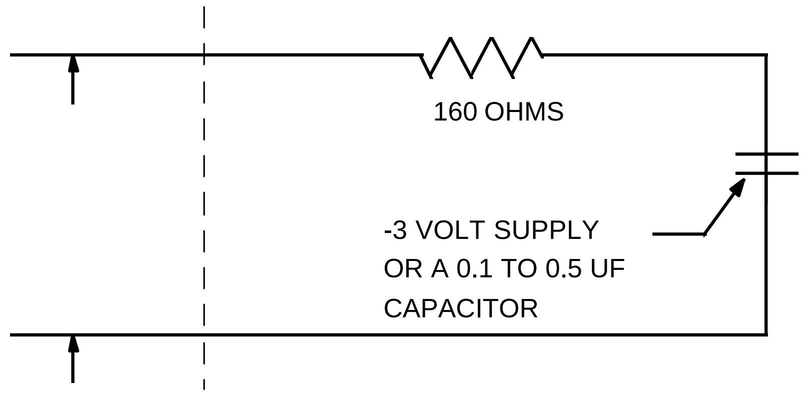


FIGURE 4-6. EQUIVALENT INPUT LINE CIRCUIT

4.3.3.2 Type A Output Drivers

Each Type A line driver circuit has the following characteristics when driving a line with any characteristics impedance between 120 ohms and 180 ohms:

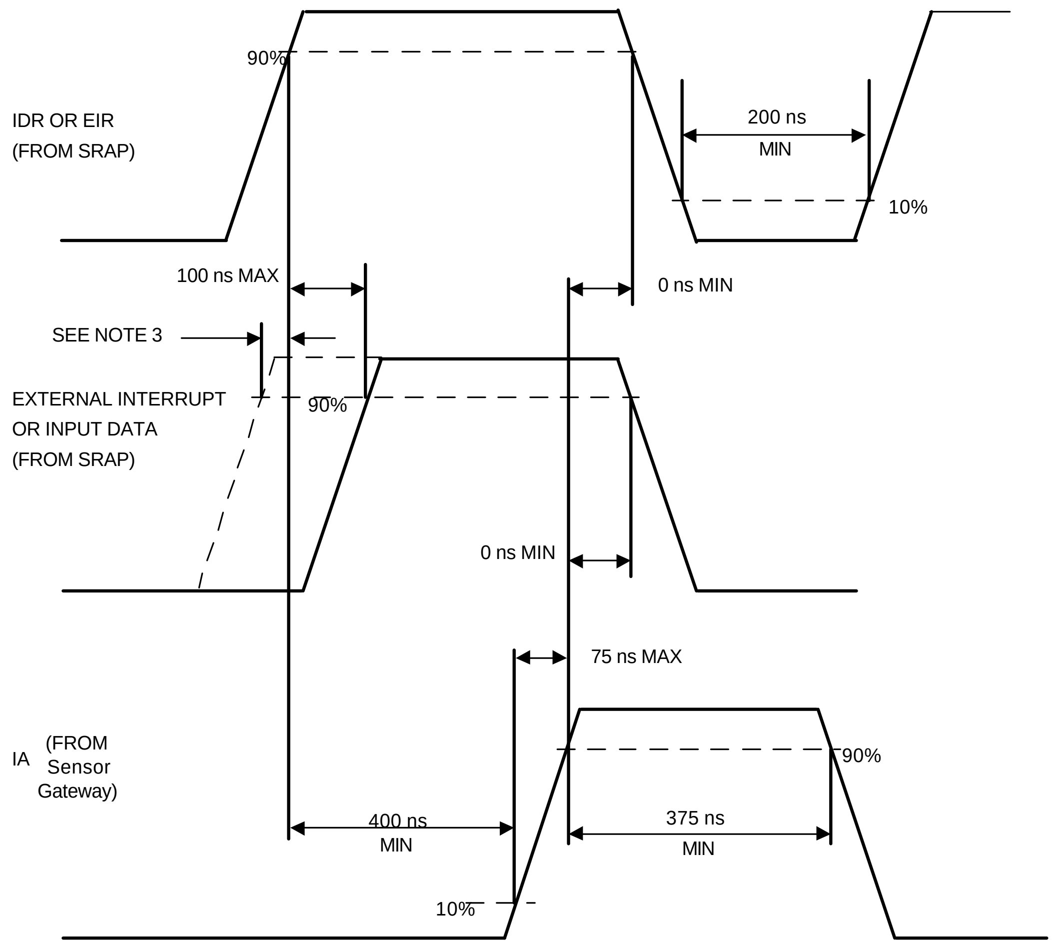
1. The binary 1 state of a data line driver is 0 volts to -0.5 volt at the terminals of the equipment under all conditions.
2. The binary 0 state of a data line driver is -3.0 to -4.5 volts at the terminals of the equipment.
3. In the binary 1 state, the data line driver circuit can provide 25 milliamperes current to the line and the control line driver can provide 37 milliamperes. The zero state of a control line driver is -3.0 to -5.5 volts at the terminals of the equipment.
4. The waveform of any output circuit applied to any line has the following characteristics:
   a. The minimum rise time is 2 nanoseconds.
   b. The maximum rise time is 75 nanoseconds.
5. A circuit used to drive a control line shall present a resistance of 100,000 ohms or more from ground to the line when power is removed. Applying or removing power does not cause spurious signals on any control lines.

4.3.3.3 Signal Timing

Signal duration and timing between signals must comply with the limits specified in Figure 4-7.

These limits are neither absolute nor necessarily typical, but rather they are minimums that denote the following dual requirements:

1. Neither the initiation nor the termination of any control or data signal shall occur sooner than specified.
2. Each equipment shall be capable of recognizing data and control signals that occur at the times or any time later than the times specified and that exist for any duration equal to or greater than the durations specified.



NOTES:

1. BOTH IDR AND EIR WILL NOT BE SET TOGETHER AT ANY TIME.
2. UPPER LEVELS ARE LOGICAL ONE; LOWER LEVELS ARE LOGICAL ZERO.
3. EI OR INPUT DATA MAY BE RAISED ANY TIME BEFORE THE IDR OR EIR SETS.

FIGURE 4-7. SIGNAL TIMING, TYPE A INPUT CHANNEL

4.3.3.4 External Interrupt Enable (EIE)

The Sensor Gateway, under program control, can allow or disallow peripheral equipment from sending External Interrupt Requests (EIRs) to the NIA processing as follows:

1. The Sensor Gateway under program control (Release Interrupt Lockout (RIL), per channel) will allow the peripheral equipment to send EIRs to the Sensor Gateway.
2. The Sensor Gateway under program control (Set Interrupt Lockout (SIL), per channel) disallows the peripheral equipment from sending EIRs to the Sensor Gateway.

The SRAP responds to the EIE based upon which channel has been enabled or disabled by the Sensor Gateway. Upon recognition of the EIE by the SRAP, it will begin transmitting input data to the Sensor Gateway.

4.3.4 Protocol

The interface between the PIM and the Sensor Gateway conforms to Unisys Specification SB-10205, Rev. B, Type A channels. The PIM transfers 30 bits of data plus 2 parity bits in parallel format to the

Sensor Gateway on a Type A input channel. All data transfers are handled on a request acknowledge basis. The input channel control line functions are shown in Table 4-2.

TABLE 4-2. FUNCTION OF SENSOR GATEWAY INPUT CHANNEL CONTROL LINES

NAME OF LINE	DIRECTION OF SIGNAL	FUNCTION
Input Data Request	PIM to SG	Set condition indicates that the PIM has placed a word of data available to the Sensor Gateway (SG) on the Input Data lines of that channel.
Input Acknowledge	SG to PIM	Set condition indicates that the Sensor Gateway has read the Input Data lines of that channel.

Transfer of Input Data - When an Input Data buffer has been established for a channel, the Sensor Gateway and the PIM on the channel transfer data as follows:

1. The PIM places a word of data on the Input Data lines before or not later than 100 ns after the Input Data Request (IDR) is set (Figure 4-7).
2. The PIM sets the IDR line (to indicate that a word of data is on the Input Data lines).
3. In accordance with internal priority, the Sensor Gateway detects the setting of the IDR line.
4. The Sensor Gateway reads the data word which is on the Input Data lines.
5. The Sensor Gateway sets the Input Acknowledge line indicating that it has read the data word on the Input Data lines.
6. The PIM detects the setting of the Input Acknowledge line. (The PIM may clear the IDR line any time after detecting the setting of the Input Acknowledge line, but it must clear the IDR before the Sensor Gateway will recognize the next IDR.)

The Sensor Gateway and PIM shall repeat this sequence for each successive word of data until they have transferred the block of data specified by the Sensor Gateway.

4.3.5 Data Format

The data transferred from the SRAP PIM consists of five types of 30-bit data words: beacon, radar, weather, alarm, and sector. Bit positions and field data for each data word are shown in Figure 4-8 through Figure 4-12.

1) BEACON REPORT

<table>
<tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>P2</td><td>P1</td><td colspan="3">N</td><td colspan="2">RNG</td><td>T</td><td colspan="3">Q</td><td colspan="6">ID</td><td colspan="3">N</td><td colspan="12">RANGE</td></tr>
<tr><td>P2</td><td>P1</td><td colspan="3">N</td><td colspan="12">AZIMUTH</td><td colspan="3">N</td><td colspan="12">3/A CODE</td></tr>
<tr><td>P2</td><td>P1</td><td colspan="3">N</td><td>Rr</td><td colspan="11">ALTITUDE</td><td colspan="3">N</td><td colspan="5">BHC</td><td>R</td><td>X</td><td>S</td><td colspan="2">Vc</td><td colspan="2">Va</td></tr>
</table>

N : NOT USED
P1 : LOWER HALF-WORD PARITY
P2 : UPPER HALF-WORD PARITY
ID : 010 110 (26_8)
Q : QUALITY OF BEACON OR QUALITY OF RADAR WHEN RADAR REINFORCED BIT SET
T : TEST TARGET
RNG : TWO MSBs TARGET RANGE (MSB = 128 NM)
RANGE : 12 LSBs TARGET RANGE (LSB = 1/64 NM)
AZIMUTH : LSB = 1 ACP, 4096 ACPs PER SCAN
3/A CODE : 0000 - 7777 OCTAL CODE VALUE
ALTITUDE : MODE C ALTITUDE (ONEs COMPLEMENT)
LSB = 100 FEET (BITS 9-0), SIGN (BIT 10)
= 1777 - ILLEGAL ALTITUDE CODE REPORTED
= 1776 - BRACKETS ONLY ON MODE C
Rr : RADAR REINFORCED
Va : 3/A CODE VALIDITY
= 00 - ALL REPLIES ARE GARBLED
= 01 - ONE REPLY IS NOT GARBLED
= 10 - ONE GARBLED REPLY AND ONE UNGARBLED REPLY HAVE IDENTICAL CODES
= 11 - TWO UNGARBLED REPLIES HAVE IDENTICAL CODES
Vc : MODE C VALIDITY
= 00 - NO REPLIES OR ALL REPLIES GARBLED
= 01 - ONE REPLY IS NOT GARBLED
= 10 - ONE GARBLED REPLY AND ONE UNGARBLED REPLY HAVE IDENTICAL CODES
= 11 - TWO UNGARBLED REPLIES HAVE IDENTICAL CODES
S : SPI
X : CODE BIT INDICATING UNMANNED AIRCRAFT
R : RING TARGET INDICATION
1 = RING
0 = NORMAL
BHC : BEACON HIT COUNT (0-31)

FIGURE 4-8. PIM OUTPUT WORD FORMAT FOR BEACON REPORT

2) RADAR REPORT

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P2	P1	N			RNG		T	Q			ID						N			RANGE											
P2	P1	N			AZIMUTH												N														

N : NOT USED
P1 : LOWER HALF-WORD PARITY
P2 : UPPER HALF-WORD PARITY
ID : 001 010 (12_8)
Q : REPORT QUALITY 0 - 7
T : TEST TARGET
RANGE : 12 LSBs TARGET RANGE (LSB = 1/64 NM)
RNG : RANGE TWO MSB (MSB = 128 NM)
AZIMUTH : LSB = 1 ACP, 4096 ACPs PER SCAN

FIGURE 4-9. PIM OUTPUT WORD FORMAT FOR RADAR REPORT

3) WEATHER MAP

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P2	P1	N						WT			ID						N				SECTOR							W1			
P2	P1	N			W2												N														

N : NOT USED
P1 : LOWER HALF-WORD PARITY
P2 : UPPER HALF-WORD PARITY
ID : 100 100 (44_8)
WT : WEATHER TYPE = 0 LIGHT ZONE 1
1 LIGHT ZONE 2
2 LIGHT ZONE 3
3 LIGHT ZONE 4
4 HEAVY ZONE 1
5 HEAVY ZONE 2
6 HEAVY ZONE 3
7 HEAVY ZONE 4
SECTOR : 0-177 CORRESPONDING TO AZIMUTH SECTOR 0-127 (DECIMAL). EACH SECTOR = 32 ACPs
W1,W2 : COMBINED TO FORM A 16-BIT FIELD WHERE W1 IS UPPER 4 SIGNIFICANT BITS AND W2 IS LOWER 12 SIGNIFICANT BITS (LSB = 32 RCs)

FIGURE 4-10. PIM OUTPUT WORD FOR WEATHER MAP

4) ALARMS

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P2	P1	N						A	SCE		ID						N			ALARMS											
								WORD 0												WORD 1											

N : NOT USED

P1 : LOWER HALF-WORD PARITY

P2 : UPPER HALF-WORD PARITY

SCE : MERGE PROCESSOR = 11, RDAS = 01, BDAS = 10

ID : MESSAGE ID = 110110 (66_8)

IF SCE = 11 (MERGE PROCESSOR):

ALARM WORD 1

BIT 0 = 1 RDAS/RDAS DATA TIMEOUT
1 = 1 RDAS ID CODE INCORRECT
2 = 1 RDAS/BDAS SECTORS NOT EQUAL
3 = 1 RDAS DATA TIMEOUT
4 = 1 RADAR OR OUTPUT TABLE OVERFLOW
5 = 1 OUTPUT FIFO FULL
6 = 11 NOT USED

ALARM WORD 0

BIT 23 NOT USED

IF SCE = 10 (BDAS):

ALARM WORD 1

BIT 0 = 1 BMC TABLE OVERFLOW
1 = 1 RESTART PERFORMED
2 = 1 BEX/BMC DATA TIMEOUT
3 NOT USED
4 = 1 RADAR/CODE WORDS OUT OF ORDER
5 = 1 AZIMUTH OUT OF TOLERANCE
6 = 1 INTERLACE ERROR
7 = 1 TEST TARGET ERROR
8 = 1 BEX DETECTED AZIMUTH ALARM
9 = 1 BEX DETECTED RANGE ALARM
10 = 1 BEX DETECTED MODE ALARM
11 = 1 BEX/BMC INPUT FIFO FULL

ALARM WORD 0

BIT 23 = 1 BEX DEFRUITER OVERLOAD ALARM

FIGURE 4-11. PIM OUTPUT WORD FOR ALARMS

4) ALARMS (CONTINUED)

IF SCE = 01 (RDAS):

ALARM WORD 1

BIT 0 = 1 REX/RMC INPUT FIFO FULL
1 = 1 REX DETECTED AZIMUTH ALARM
2 = 1 REX DETECTED RANGE ALARM
3 = 1 TEST TARGET NOT DETECTED
4 = 1 TARGET WORDS OUT OF ORDER
5 = 1 AZIMUTH OUT OF TOLERANCE
6 = 1 SECTOR MTI TARGET OVERLOAD
7 = 1 REX/RMC DATA TIMEOUT
8 = 1 RESTART DATA
9 = 1 RMC RESTART DATA TIMEOUT
10 = 1 RMC TABLE OVERFLOW
11 = 1 RMC OVERLOAD, TASKS NOT COMPLETED

ALARM WORD 0

BIT 23 NOT USED

FIGURE 4-11. PIM OUTPUT WORD FOR ALARMS (CONTINUED)

5) SECTOR

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P2	P1	N			C	SECTOR					ID						N														

N : NOT USED
P1 : LOWER HALF-WORD PARITY
P2 : UPPER HALF-WORD PARITY
ID : 001 101 (15_8)
SECTOR : 0-37 CORRESPONDING TO AZIMUTH SECTOR 0-31 (DECIMAL)
C : 1 COMBINED RADAR AND BEACON SECTOR MARK
0 RADAR OR BEACON-ONLY SECTOR MARK

FIGURE 4-12. PIM OUTPUT WORD FOR SECTOR MARK

Section 5
LOCAL DBRITE INTERFACE

5.1 GENERAL DESCRIPTION

The Local ARTS IIIE DBRITE is the external interface of the ARTS IIIE configuration of ARTS with the ARTS III version of the DBRITE subsystem (except display and data entry may be remoted) within the facility. Figure 5-1 illustrates the digital interface and the Minimum Safe Altitude Warning (MSAW) alarm to the DBRITE subsystem for the ARTS IIIE configuration. The Local DBRITE interfaces with the Local BANS Processors (LBPs) via a Type A 30-bit parallel digital interface. There is an additional interface for the MSAW alarm driven by an MSAW generator located in the LPB chassis.

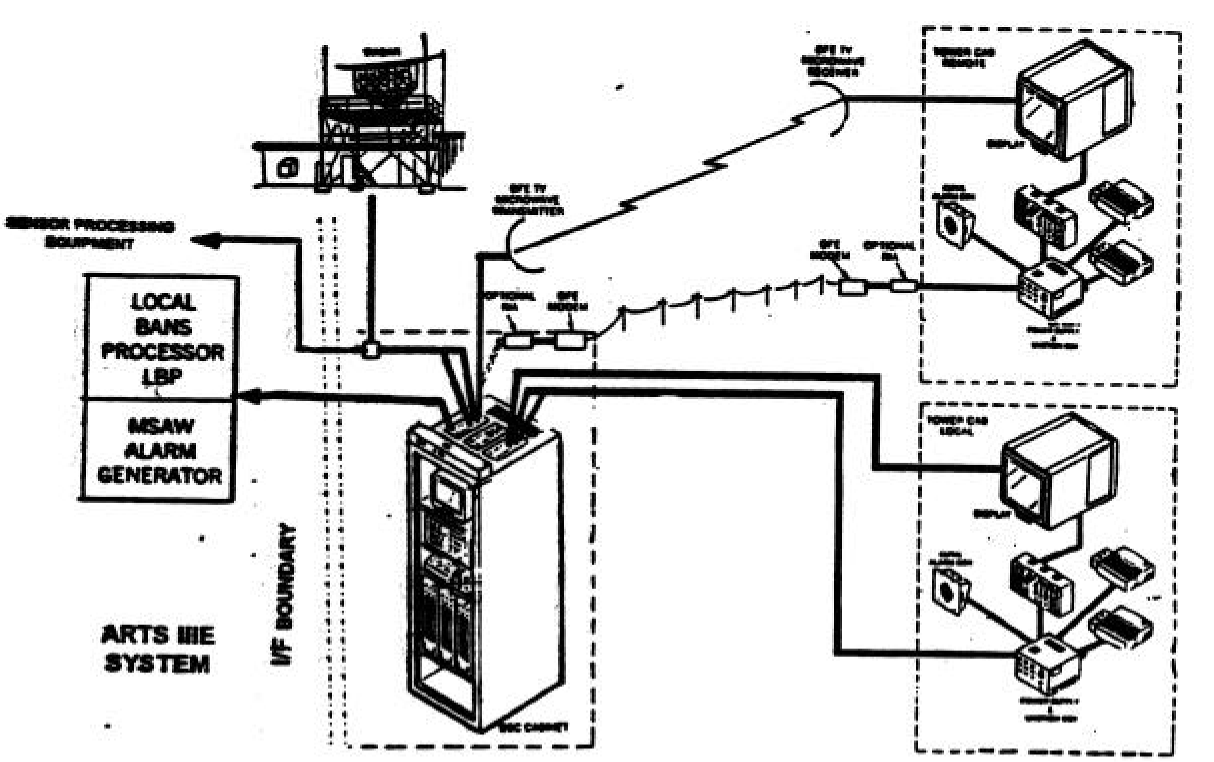


FIGURE 5-1. ARTS IIIE LOCAL DBRITE EQUIPMENT BLOCK DIAGRAM

5.2 REFERENCED DOCUMENTS

5.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

5.2.1.1 Applicable Government Documents

Specifications

None.

Standards

None.

Other Publications

None.

5.2.1.2 Applicable Non-Government Documents

Specifications

SB-10205	Input/Output Channel Characteristics Input/Output Processor (IOP)

Standards

EIA-RS-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Exchange
EIA-RS-422-A	Electrical Characteristics of Balanced Voltage Digital Interface Circuits, December 1978
EIA-RS-449	General Purpose 37-Position and 9-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange, January 1978 (Reaffirmed)
EIA-TIA-530-A	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Including Alternative 26-Position Connector (ANSI/TIA-530-A-92), June 1992

Other Publications

TI 6410.18	Technical Manual Operation DBRITE System
ATC 61014	Hardware Top-Level Design Document (CDRL E004)
ATC 61004	System Segment Specification/Hardware Requirements Specification (CDRL E001)
ATC 61014	Hardware Detailed Design Document (CDRL E005)

5.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052	ARTS IIIE Upgrade To Selected Air Traffic Control Facilities, Modification 8, 31 December 1993
DTFA01-90-C-00057	ARTS IIA Interim Support Program for Air Traffic Control Facilities

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993

FAA Computer Program Functional Specifications

None.

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

5.3 LOCAL ARTS III DBRITE INTERFACE DESCRIPTION

5.3.1 General Information

The ARTS III DBRITE interface provides the control tower operator with the capability of displaying an alphanumeric (A/N) presentation with radar video. The A/N equipment generates alphanumeric signals, mixes the signals with radar analog video, and sends the composite signal to the DBRITE display. The information to generate the alphanumeric signals is received from the ARTS system via the LBP and the radar analog video from local distribution. The composite video as seen on the DBRITE display is the normal radar data from a digital scan converter complemented with the alphanumeric data. Data entry is accomplished through the use of a DBRITE A/N keyboard and a Position Entry Module (PEM).

The Parallel Interface Module (PIM) in the LBP provides a parallel data interface between the LBP and the DBRITE A/N subsystem.

5.3.2 Mechanical Characteristics

Type A channel 120-pin connector assignments are shown in Table 5-1.

5.3.3 Electrical Characteristics

5.3.3.1 Type A Interface

The Type A interface is characterized by nominal differential values of 0 and -3 volts to represent the binary 1 and 0 states, respectively. The electrical characteristics are as specified in the following subparagraphs.

TABLE 5-1. CONNECTOR PIN ASSIGNMENT, TYPE A CHANNEL

*SIGNAL	RETURN	OUTPUT CHANNEL CONNECTOR	INPUT CHANNEL CONNECTOR
B1	-	Shield Ground	Shield Ground
B3	A3	Lower Half-Word Parity	Lower Half-Word Parity
B4	A4	Upper Half-Word Parity	Upper Half-Word Parity
B5	A5	Output Data Acknowledge	Input Data Request
B6	A6	Output Data Request	Input Data Acknowledge
B7	A7	External Function Acknowledge	External Interrupt Request
B8	A8	External Function Request	External Interrupt Enable
D1	C1	Data Bit 0	Data Bit 0
↕	↕	↕	↕
D12	C12	Data Bit 11	Data Bit 11
G1	H1	Data Bit 12	Data Bit 12
↕	↕	↕	↕
G12	H12	Data Bit 23	Data Bit 23
J1	K1	Data Bit 24	Data Bit 24
↕	↕	↕	↕
J6	K6	Data Bit 29	Data Bit 29

* Each signal and the corresponding return, except shield ground, require a twisted pair.

Each Type A input amplifier circuit has the following characteristics (all voltage values are differential with respect to signal return):

1. The maximum steady state current drawn from a line by an input circuit does not exceed 21 milliamperes when the input is between 0 volts and -0.5 volt.
2. The input circuit is such that if the input wire is disconnected, the effect will be as though a zero were present at the input.
3. The threshold level distinguishing the one state is a voltage level at the input more positive than -1.1 volts. The threshold level distinguishing a zero state is more negative than -2.5 volts.
4. The equivalent circuit as seen across the input line is as specified in Figure 5-2. The signal is transmitted through twisted pair and terminated in a 160-ohm impedance differential amplifier for common mode noise rejection.
5. External equipment resynchronizes all control signals (i.e., signals other than data) by sensing the control signal transition from the zero to the one state.

5.3.3.2 Type A Output Drivers

Each Type A line driver circuit has the following characteristics when driving a line with any characteristics impedance between 120 ohms and 180 ohms (all voltage values are differential with respect to signal return):

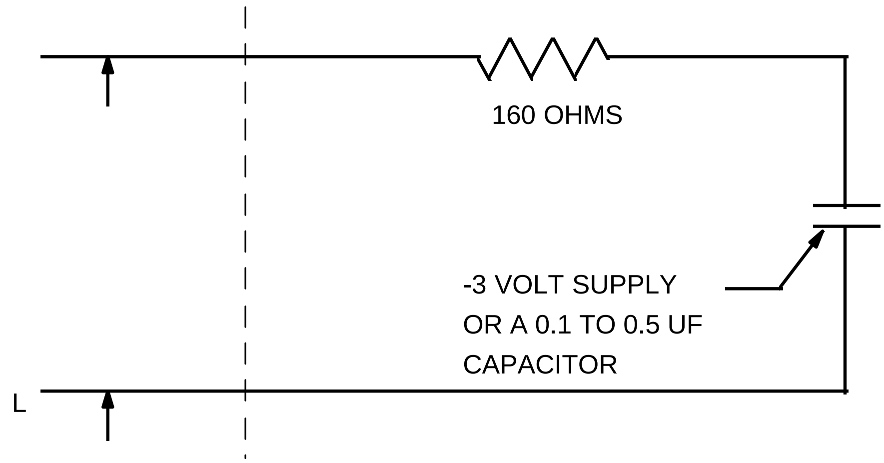


FIGURE 5-2. EQUIVALENT INPUT LINE CIRCUIT

1. The binary 1 state of a Data Line Driver is 0 volts to -0.5 volt at the terminals of the equipment under all conditions.
2. The binary 0 state of a Data Line Driver is -3.0 to -4.5 volts at the terminals of the equipment.
3. In the binary one state, the Data Line driver circuit can provide 25 milliamperes current to the line and the control Line Driver can provide 37 milliamperes. The zero state of a control line driver is -3.0 to -5.5 volts at the terminals of the equipment.
4. The waveform of any output circuit applied to any line has the following characteristics:
   a. The minimum rise time is 2 nanoseconds.
   b. The maximum rise time is 75 nanoseconds.
5. A circuit used to drive a control line shall present a resistance of 100,000 ohms or more from ground to the line when power is removed. Applying or removing power does not cause spurious signals on any control lines.

5.3.3.3 Signal Timing

Signal duration and timing between signals must comply with the limits specified in Figure 5-3 and Figure 5-4.

5.3.3.4 Minimum Safe Altitude Warning Alarm Interface

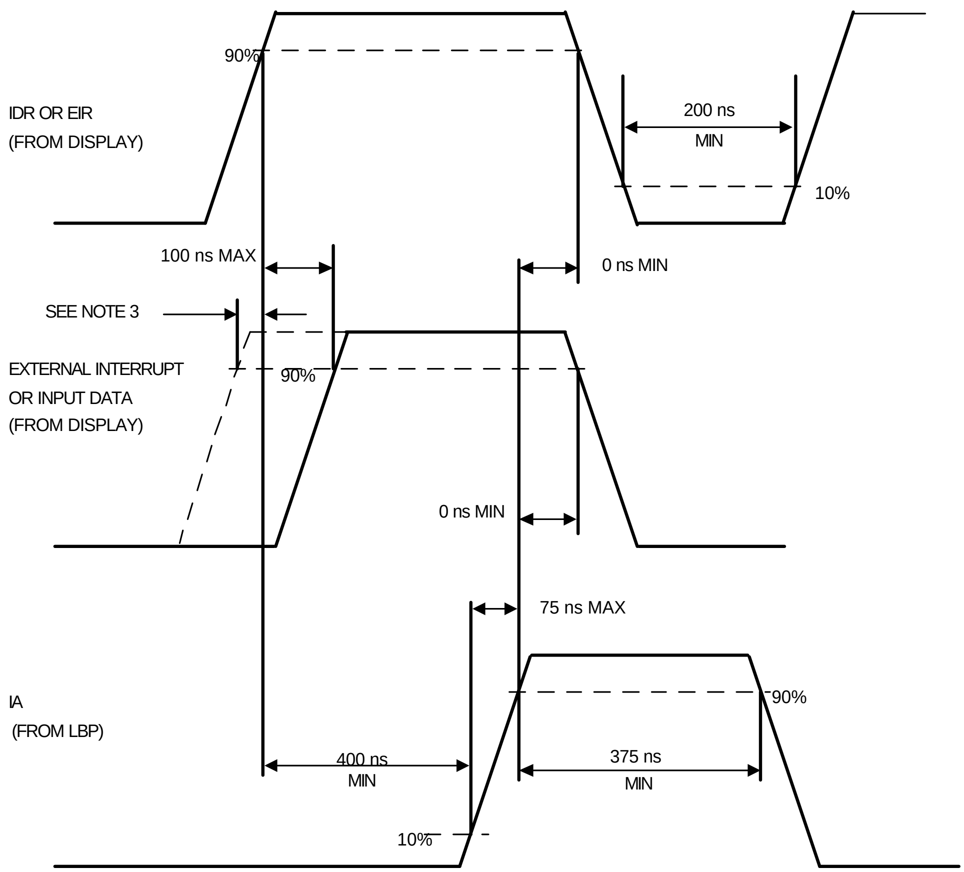
The MSAW protocol between the ARTS IIIE and DBRITE subsystem is an audio signal of 450 hertz switched on and off every 100 milliseconds. Figure 5-5 illustrates this signal. This interface is under software control initiated by the ARTS system to the LBP. The signals used by this protocol are listed in Table 5-2. The MSAW alarm audio signal shall be a 450 hertz signal on an RG 58/u (50 ohm) coaxial cable, detected and terminated in a high impedance (>7.5K ohms). The amplitude of the signal is 1.0 volts minimum.

5.3.4 Protocol

The interface between the LBP and the DBRITE A/N subsystem conforms to Unisys specification SB-10205, Rev. B, Type A channels. The LBP's PIM transfers and receives 30 bits of data plus 2 parity bits in parallel format. All data transfers are handled on a request acknowledge basis. Channel control lines function as shown in Table 5-3 and Table 5-4 .

5.3.4.1 Transfer of Input Data

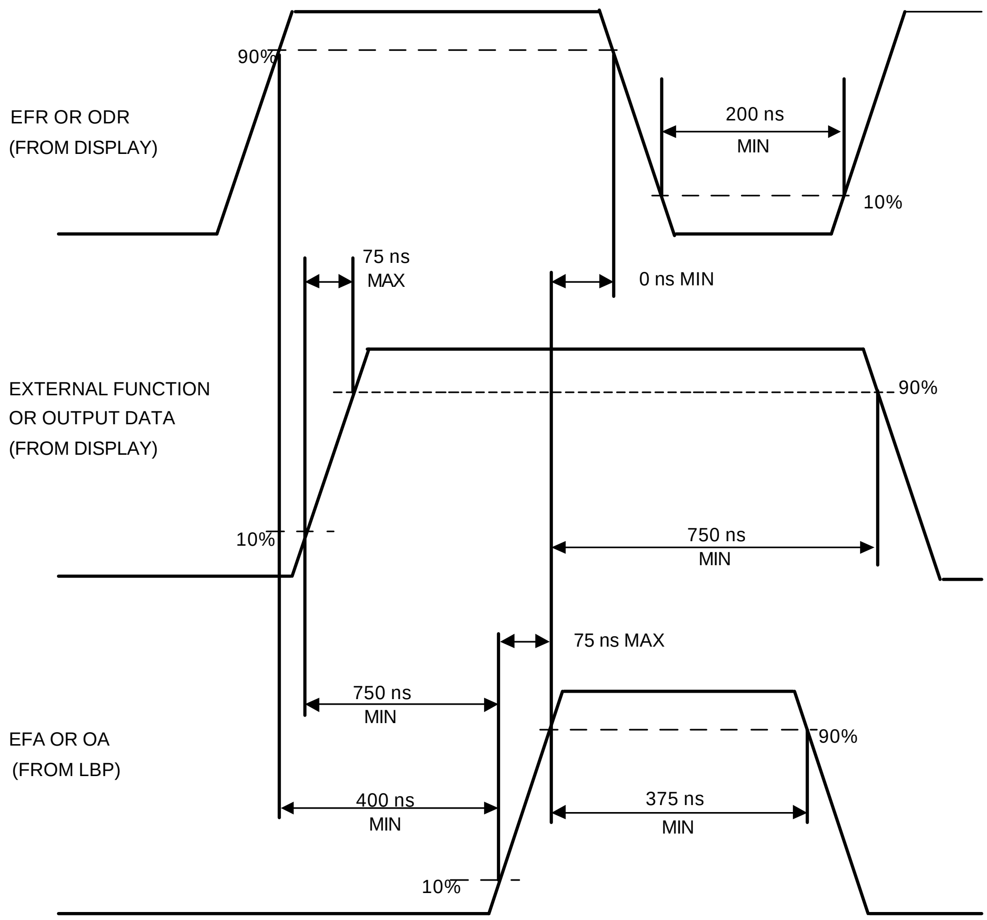
Whenever an input data buffer has been established for a channel, the LBP and the DBRITE transfer data as follows:



NOTES:

1. BOTH IDR AND EIR WILL NOT BE SET TOGETHER AT ANY TIME.
2. UPPER LEVELS ARE LOGICAL ONE; LOWER LEVELS ARE LOGICAL ZERO.
3. EI OR INPUT DATA MAY BE RAISED ANY TIME BEFORE THE IDR OR EIR SETS.

FIGURE 5-3. SIGNAL TIMING, TYPE A INPUT CHANNEL



NOTE: UPPER LEVELS ARE LOGICAL ONE; LOWER LEVELS ARE LOGICAL ZERO.

FIGURE 5-4. SIGNAL TIMING, TYPE A OUTPUT CHANNEL

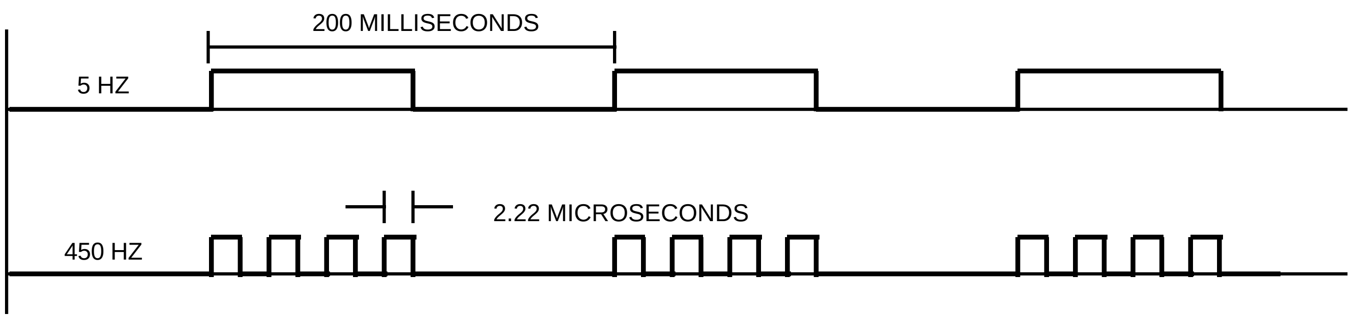


FIGURE 5-5. MSAW ALARM SIGNAL

TABLE 5-2. MSAW ALARM INTERFACE SIGNALS

SIGNAL	SOURCE
MSAW Audio Signal	ARTS IIIE
Shield (Ground)	ARTS IIIE

TABLE 5-3. FUNCTION OF INPUT CHANNEL CONTROL LINES

NAME OF LINE	DIRECTION OF SIGNAL	FUNCTION
External Interrupt Enable	LBP to Display	Set condition indicates readiness of the LBP to accept an external code word on that channel.
Input Data Request	Display to LBP	Set condition indicates that the display equipment has placed a word of data available to the LBP on the Input Data lines of that channel.
External Interrupt Request	Display to LBP	Set condition indicates the display equipment has placed an interrupt code word available to the LBP on the Input Data lines of that channel.
Input Acknowledge	LBP to Display	Set condition indicates that the LBP has read the Input Data lines of that channel.

TABLE 5-4. FUNCTION OF OUTPUT CHANNEL CONTROL LINES

NAME OF LINE	DIRECTION OF SIGNAL	FUNCTION
Output Data Request	Display to LBP	Set condition indicates that the display has placed a word of data available to the LBP on the Input Data lines of that channel.
Output Acknowledge	LBP to Display	Set condition indicates that the LBP has read the Input Data lines of that channel.

1. The display equipment places a word of data on the Input Data lines before or not later than 100 ns after the IDR is set (see Figure 5-3).
2. The display equipment sets the IDR line (to indicate that a word of data is on the Input Data lines).

3. In accordance with internal priority, the LBP detects the setting of the IDR line.
4. The LBP reads the data word which is on the Input Data lines.
5. The LBP sets the Input Acknowledge line (indicating that it has read the data word on the Input Data lines).
6. The display equipment detects the setting of the Input Acknowledge line. (The display equipment may clear the IDR line any time after detecting the setting of the Input Acknowledge line, but it must clear the IDR line before the LBP will recognize the next IDR).
7. The LBP clears the Input Acknowledge line before it reads the next word on the Input Data lines.

The LBP and display equipment repeat this sequence for each successive word of data until they have transferred the block of data specified by the input buffer control words.

5.3.4.2 Transfer of Output Data

Whenever an output data buffer has been established for a channel, the LBP and the DBRITE transfer data as follows:

1. When the display equipment is ready to accept data, the display equipment sets the Output Data Request (ODR) line (this may already have happened before the Output Data buffer was established).
2. In accordance with internal priority, the LBP detects the setting of the ODR line.
3. The LBP places a word of data on the Output Data lines.
4. The LBP sets the Output Acknowledge line (to indicate that a word of data is on the Output Data lines).
5. The display equipment detects the setting of the Output Acknowledge line. (The display equipment may clear the ODR line any time after detecting the setting of the Output Acknowledge line, but it must clear the ODR line before the LBP will recognize the next ODR.)
6. The display equipment reads the data word which is on the Output Data lines.
7. The LBP clears the Output Acknowledge line before it places the next word on the Output Data lines.

The LBP and the display equipment repeat this sequence for each successive word of data until they have transferred the block of data words specified by the output buffer control words.

5.3.4.3 External Interrupt Code Word

The LBP, under program control, sets the External Interrupt (EI) code word as follows:

1. The LBP under program control sets the EIE line.
2. The display equipment detects the setting of the EIE line (this step is omitted for display equipment which does not use the EIE line).
3. The display equipment places an EI code word on the Input Data lines before or not later than 100 ns after the EIR is set (see Figure 5-4).
4. The display equipment sets the EIR line (to indicate that the EI code word is on the Input Data lines).
5. In accordance with internal priority, the LBP detects the setting of the EIR line.
6. The LBP reads the EI code word which is on the Input Data lines.
7. The LBP clears the EIE line.
8. The LBP sets the Input Acknowledge line.

9. The display equipment detects the setting of the Input Acknowledge line. (The display equipment may clear the EIR line any time after detecting the setting of the Input Acknowledge line, but it must clear the EIR line before the LBP will recognize the next External Interrupt Request).
10. The LBP clears the Input Acknowledge line before it reads the next word on the Input Data lines.

5.3.4.4 External Interrupt Enable

The LBP, under program control, can allow or disallow display equipment from sending EIRs to the LBP. Processing is as follows:

1. The LBP under program control (Release Interrupt Lockout (RIL), per channel) will allow the display equipment to send EIRs to the LBP.
2. The LBP under program control (Set Interrupt Lockout (SIL), per channel) disallows the display equipment from sending EIRs to the LBP.

If an EIR is to be sent on the enabled channel, refer to paragraph 5.3.4.3 for the sequence of events.

5.3.5 Data Formats

The LBP sends data to and receives data from the DBRITE on the 30 lines (plus 2 parity) of a Type A channel. Data is sent from the LBP on an output channel and received on an input channel.

The output words from the LBP consist of three types. They are designated A, B, and C. Character and control symbol codes for the B and C words are shown in Table 5-5 and Table 5-6.

The A word provides data for display blinking, leader direction, force conditions, format type, and coordinate system. The A word is shown in Figure 5-6. Bits 7 and 8 designate the type of data to follow and how a following output data word sequence is to be interpreted.

The B word may be in either radar or display coordinates as shown in Figure 5-7 and Figure 5-8. The B word is interpreted as shown in Figure 5-7 when the previous A word bit 15 was 0 and as shown in Figure 5-8 when the previous A word bit 15 was 1.

TABLE 5-5. BINARY CODES FOR ALPHANUMERIC DISPLAY

BINARY CODE	A/N SYMBOLS	BINARY CODE	A/N SYMBOLS
000 000	0	010 101	L
000 001	1	010 110	M
000 010	2	010 111	N
000 011	3	011 000	O
000 100	4	011 001	P
000 101	5	011 010	Q
000 100	6	011 011	R
000 111	7	011 100	S
001 000	8	011 101	T
001 001	9	011 110	U
001 010	A	011 111	V
001 011	B	100 000	W
001 100	C	100 001	X
001 101	D	100 010	Y
001 110	E	100 011	Z
001 111	F	100 100	(dot)
010 000	G	100 101	+
010 001	H	100 110	(delta)
010 010	I	100 111	/
010 011	J	101 000	*
010 100	K	101 001	Space

TABLE 5-6. DISPLAY COMMAND CODES

BINARY CODE	COMMAND	FUNCTION
110 000	BLINK	Brackets alphanumerics where to blink. First blink command initiates blinking, second blink command ends blinking.
110 001	GROSS LF/CR	GROSS LF/CR*Displays subsequent data at the beginning of the next line. Used with lines having 16 or more characters.
110 010	IGNORE	No change in displayed data; display does not space when this command is received.
110 011	EOM	Stops blinking of displayed data and indicates output data word interpretation.
110 100	SPACE	Provides one character space between previously displayed data and subsequent data in a line.
110 101	SEP	Indicates output data word interpretation.
110 110	LF/CR	Subsequent displayed data is displayed starting at the beginning of the next line. Used with lines having fewer than 16 characters.
110 111	UF/CR	Subsequent displayed data is displayed starting at the beginning of the previous line.
111 111	ILLEGAL CODE	Causes all subsequent data to be ignored until an A-type output word is received.

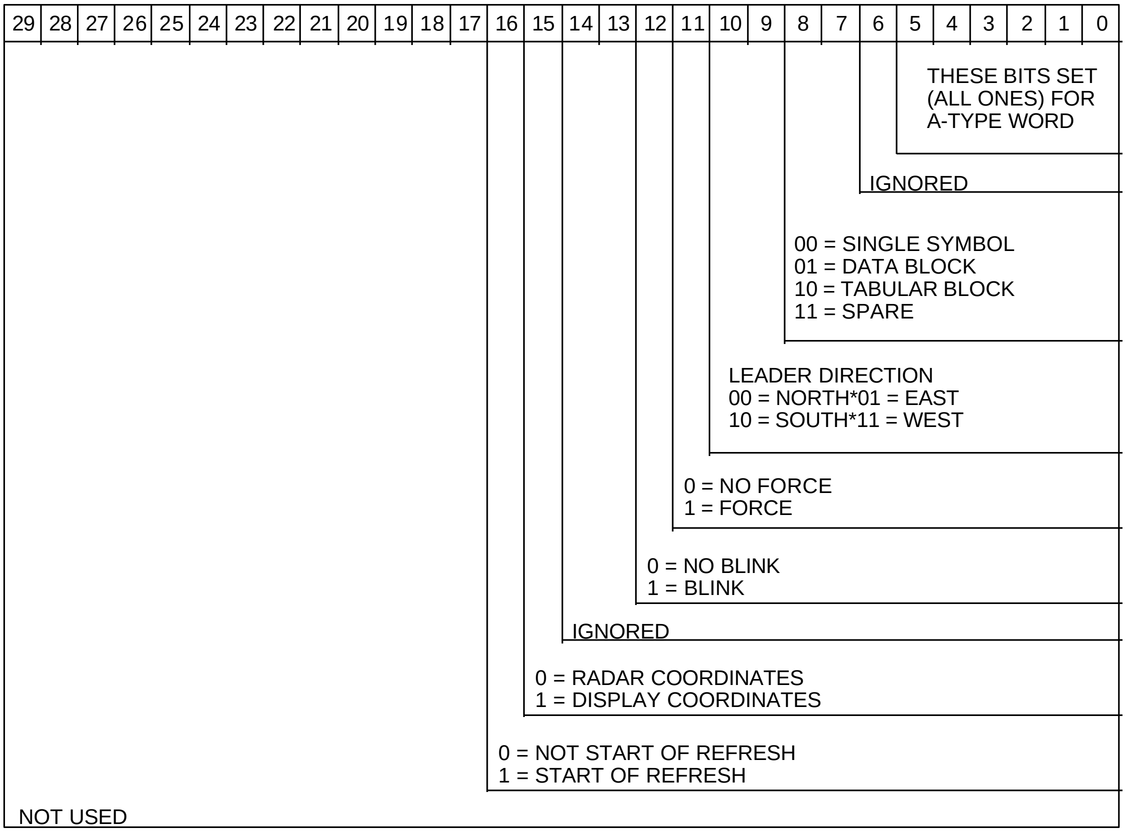


FIGURE 5-6. A-WORD FORMAT

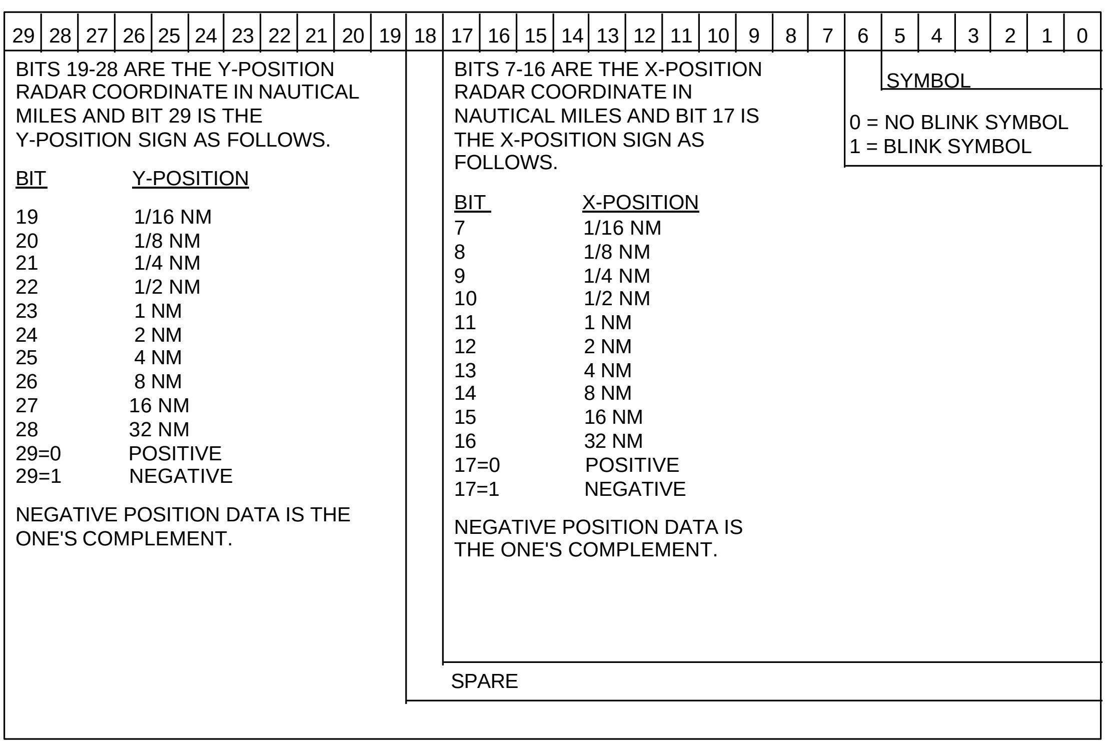


FIGURE 5-7. B-WORD FORMAT, RADAR COORDINATES

The C word identifies up to five A/N symbols for display as specified in the previous A word (see Figure 5-9). The DBRITE normally receives one A word followed by one B word and several C words. The expected sequence of output data is capable of being changed as follows:

1. Bits 0-5 set in an output word is always an A word.
2. An EOM code (Table 5-6) in bits 0-5 of a B or C word, indicates end-of-format and shall cause the processor to interpret the next output data word as a B word with the instructions from the previous A word in effect.

29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

BITS 19-28 ARE THE Y-POSITION DISPLAY COORDINATE IN TERMS OF A FRACTION OF THE DISPLAY RADIUS (R) AND BIT 29 IS THE Y-POSITION SIGN AS FOLLOWS.

BIT	Y-POSITION
19	1/1024 R
20	1/512 R
21	1/256 R
22	1/128 R
23	1/64 R
24	1/32 R
25	1/16 R
26	1/8 R
27	1/4 R
28	1/2 R
29=0	POSITIVE
29=1	NEGATIVE

NEGATIVE POSITION DATA IS IN ONE'S COMPLEMENT.

BITS 7-16 ARE THE X-POSITION DISPLAY COORDINATE IN TERMS OF A FRACTION OF THE DISPLAY RADIUS (R) AND BIT 17 IS THE X-POSITION SIGN AS FOLLOWS.

BIT	X-POSITION
7	1/1024 R
8	1/512 R
9	1/256 R
10	1/128 R
11	1/64 R
12	1/32 R
13	1/16 R
14	1/8 R
15	1/4 R
16	1/2 R
17=0	POSITIVE
17=1	NEGATIVE

NEGATIVE POSITION DATA IS IN ONE'S COMPLEMENT.

SYMBOL (bits 0-5)

0 = NO BLINK SYMBOL
1 = BLINK SYMBOL

SPARE (bit 18)

FIGURE 5-8. B-WORD FORMAT, DISPLAY COORDINATES

29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SYMBOL NO. 1						SYMBOL NO. 2						SYMBOL NO. 3						SYMBOL NO. 4						SYMBOL NO. 5					

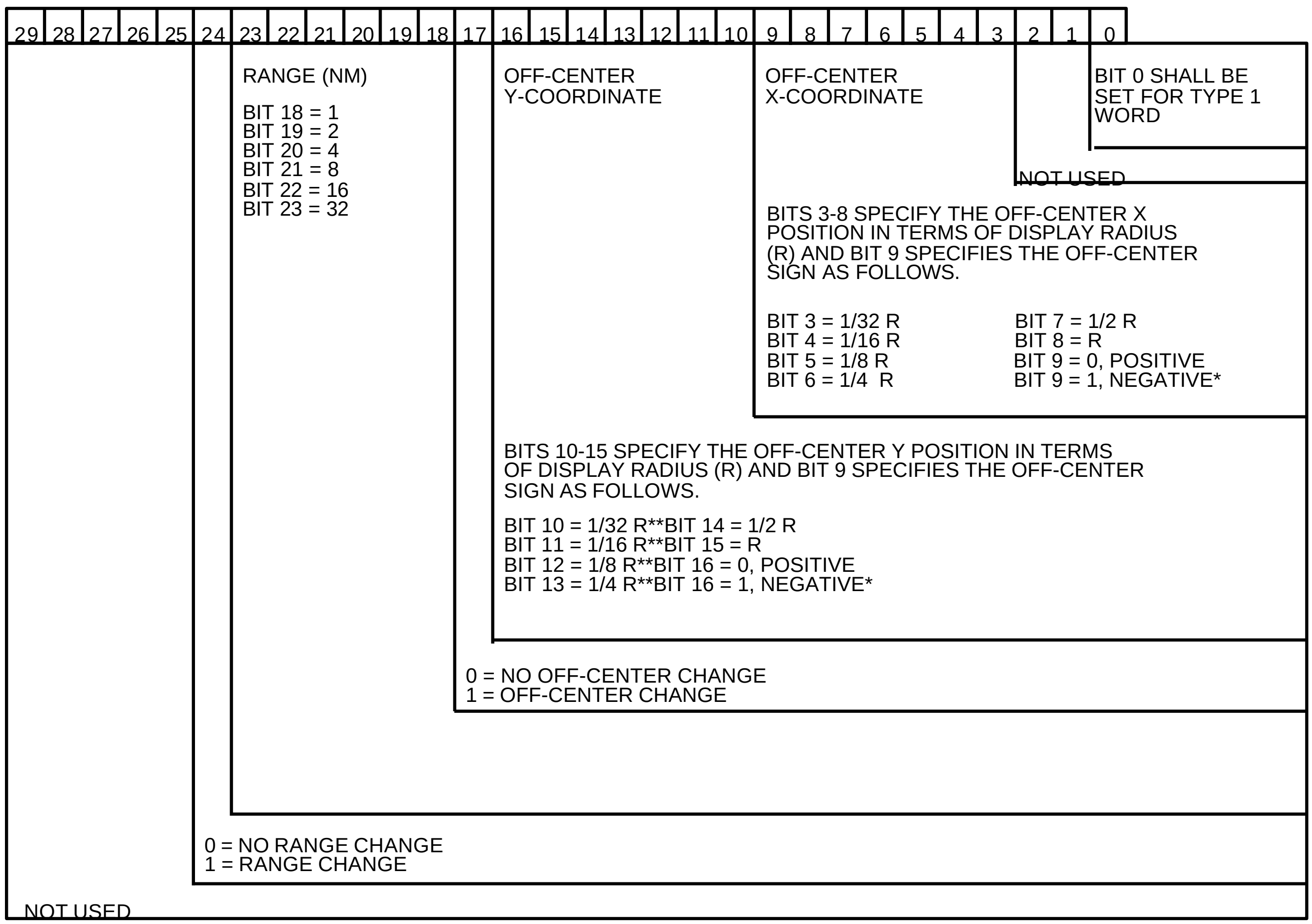
FIGURE 5-9. C-WORD FORMAT

3. When bit 16 of an A word is set, the DBRITE inhibits the processing of additional words until such time that the minimum refresh rate period (33 ms) has expired. This provides a control to limit the maximum refresh rate when short buffers are presented to the DBRITE subsystem.
4. When bits 7 and 8 of the A word specify single symbol data, subsequent output words shall be interpreted as B words.
5. A SEP code (Table 5-6) in bits 0-5 of a B or C word is processed as follows:
   a. In a tabular message, the DBRITE subsystem ignores the SEP code.
   b. In a data block message, the DBRITE subsystem interprets a SEP code as if it were an EOM code.

Data originating in the DBRITE is sent to the LBP via an input data channel. Input data words consist of console status, key module entries, and PEM position. The input data words are designated Type 1 and Type 2 and are shown in Figure 5-10 and Figure 5-11.

The DBRITE transfers one Type 1 word followed by three Type 2 words. The Type 1 word and the first Type 2 word sent correspond to the operational A/N equipment. The last two Type 2 words correspond to nonexistent key modules No. 2 and No. 3. Therefore, they are sent with a disconnect code (1 111 110) in bits 3-9. Transferring four input data words makes the interface compatible with overall ARTS III site interface.

The LBP also receives interrupt data over the input data channel. The DBRITE generates an interrupt word whenever an output data word is received from the LBP with incorrect parity. The interrupt word is bit 2 set with the remaining data bits cleared. Odd parity is used.



*DATA WITH NEGATIVE SIGN IS IN ONE'S COMPLEMENT.

FIGURE 5-10. TYPE 1 INPUT WORD FORMAT

29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

BIT 0 SHALL BE SET FOR TYPE 2 WORD

KEYBOARD:
01 = NO. 1
10 = NO. 2
11 = NO. 3

BITS 3-8 ARE CHARACTERS OR FUNCTIONS FROM KEYBOARD AND BIT 9 IS AS FOLLOWS:

BIT 9 = 0, CHARACTER
BIT 9 = 1, FUNCTION

POSITION ENTRY MODULE (PEM) X-COORDINATE. BITS 10-15 ARE THE COUNT AND BIT 16 IS THE SIGN AS FOLLOWS.

BIT 10 = 1	BIT 14 = 16
BIT 11 = 2	BIT 15 = 32
BIT 12 = 4	BIT 16 = 0, POSITIVE
BIT 13 = 8	BIT 16 = 1, NEGATIVE*

POSITION ENTRY MODULE Y-COORDINATE. BITS 17-22 ARE THE COUNT AND BIT 23 IS THE SIGN AS FOLLOWS.

BIT 17 = 1	BIT 21 = 16
BIT 18 = 2	BIT 22 = 32
BIT 19 = 4	BIT 23 = 0, POSITIVE
BIT 20 = 8	BIT 23 = 1, NEGATIVE*

0 = NO PEM CHANGE 1 = PEM CHANGE

QUICKLOOK SWITCHES

BIT 25 = SWITCH NO. 1	BIT 28 = SWITCH NO. 4	0 = OFF
BIT 26 = SWITCH NO. 2	BIT 29 = SWITCH NO. 5	1 = ON
BIT 27 = SWITCH NO. 3		

*DATA WITH NEGATIVE SIGN IS IN ONE'S COMPLEMENT.

FIGURE 5-11. TYPE 2 INPUT WORD FORMAT

Section 6
REMOTE DBRITE INTERFACE

6.1 GENERAL DESCRIPTION

The Remote DBRITE is the external interface of the ARTS for the ARTS IIIE configuration with the remote tower DBRITE A/N subsystem. Figure 6-1 illustrates the Remote Display Multiplexer (RDM) interface to the DBRITE subsystem. The RDM uses a serial interface that conforms EIA RS-232 which is connected the modems. This interface is implemented using low loss cable. This interface is not used at the ARTS IIE terminal sites.

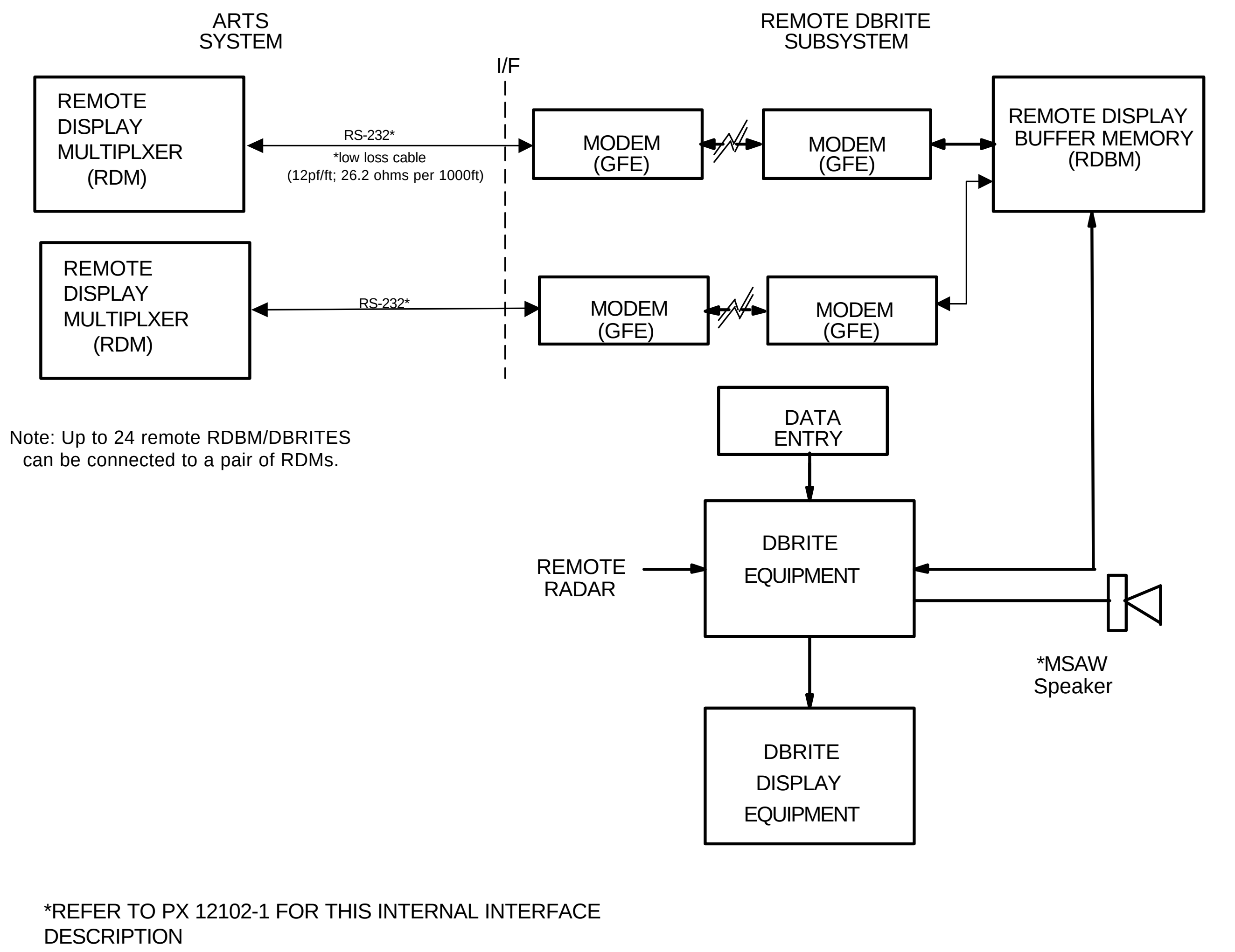


FIGURE 6-1. REMOTE DBRITE EQUIPMENT BLOCK DIAGRAM

6.2 REFERENCED DOCUMENTS

6.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

6.2.1.1 Applicable Government Documents

Specifications

None.

Standards

None.

Other Publications

None.

6.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

EIA-RS-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Exchange

Other Publications

ATC 61014	Hardware Top-Level Design Document (CDRL E004)
ATC 61004	System Segment Specification/Hardware Requirements Specification (CDRL E001)
ATC 61041	Hardware Detailed Design Document (CDRL E005)
PX 12102	Technical Manual, Remote Display Buffer Memory, Volume 1, Sections 1 and 4
TI 6410.18	Technical Manual, Operation DBRITE System

6.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052	ARTS IIIE Upgrade To Selected Air Traffic Control Facilities, Modification 8, 31 December 1993

FAA Specifications

FAA-E-2759 ARTS IIIE System Functional Specification, 13 August 1993

FAA Computer Program Functional Specifications

None.

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

6.3 REMOTE DBRITE INTERFACE DESCRIPTION

6.3.1 General Information

The RDM links up to 24 RDBM/DBRITEs to the ARTS system. In the ARTS IIIE system, the RDM is only used for the interface to a RDBM/DBRITE at remote towers. The RDBM selectively updates air traffic control information lists with data received from the RDM via communication links and presents the latest positional situation to a time-shared display. Keyboard and Position Entry Module (PEM) information from the display are accepted by the RDBM for transmission to the RDM. The RDBM is linked to the RDM by modems and telephone lines.

6.3.2 Mechanical Characteristics

The modem cable connects directly with low loss cable to the top hat of the RDM equipment rack.. Figure 6-2 is the complete illustration of the typical modem interface cabling for the RDM. The RDM RS232 interconnections are shown in Table 6-1.

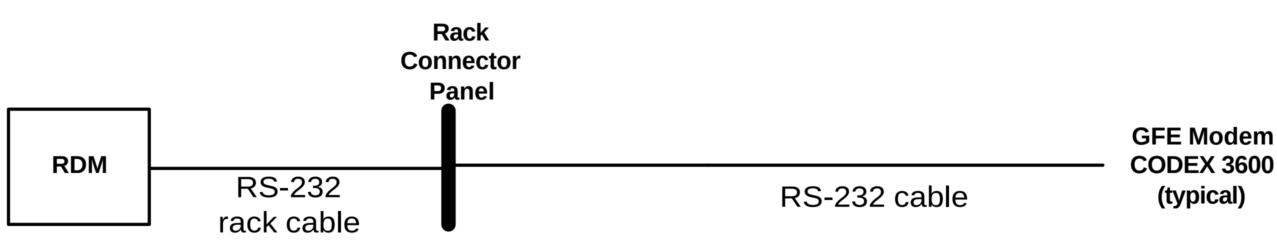


FIGURE 6-2. TYPICAL INTERNAL/EXTERNAL MODEM CABLING

TABLE 6-1. RDM EQUIPMENT CONNECTIONS

FUNCTION	RDM EQUIPMENT (DTE)
Shield	1
Transmit Data	2
Receive Data	3
Signal Ground	7
Transmit Clock (DCE)	15
Receive Clock (DCE)	17

TABLE 6-2. GFE MODEM EQUIPMENT TO RDM (RS-232)

RDM EQUIPMENT	FUNCTION	GFE EQUIPMENT (DCE)
1	Protective Ground (SG)	1
2	Transmit Data (BA)	2
3	Receive Data (BB)	3
7	Signal Ground (AB)	7
15	Transmit Clock (DB)	15
17	Receive Clock (DD)	17

6.3.3 Electrical Characteristics

The RDM Serial Interface Controller (SIC) has eight serial channels of which is used as a test channel. The RS-232 channel is compatible with the RS-232 with the modem interface equipment.

The SIC RS-232 signaling sense of the voltages appearing across the interconnection cable are defined as follows:

NOTATION	INTERCHANGE VOLTAGES	
	NEGATIVE	POSITIVE
BINARY STATE	1	0
SIGNAL CONDITION	MARKING	SPACING
FUNCTION	OFF	ON

6.3.4 Protocol

The RS-232 signals between the RDM and the GFE modems are described in Table 6-3.

TABLE 6-3. INTERFACE SIGNALS

SIGNAL	EIA-RS-232 IDENTIFIER	SOURCE
Transmit Data	BA	RDM Equipment
Transmit Data Clock	DB	Modem/converter
Receive Data	BB	Modem/converter

Transmit Data

The data signals originating in the RDM are transferred by the data channel to the modem. The Request to Send, Clear to Send, Data Mode, and Terminal Ready are strapped on to enable the data transfer.

Receive Data

The data signals generated by the modem in response to data channel line signals received from a remote site are transferred on this circuit to the RDM.

Transmit Data Clock

The modem signals on this circuit provide the RDM with transmit signal element timing information. The RDM provides Send Data in which the transitions between signal elements occur at the time of the transitions from OFF to

ON of the signal on Send Timing. Timing information is provided whenever the modem is powered-on.

Receive Data Clock

The modem signals on this circuit provide the RDM with receive signal element timing information. The transition from ON to OFF indicates the center of each Receive Data signal element. Timing information is provided whenever the modem is powered-on.

Cyclic Redundancy Check (CRC)

The Unisys RDBM communication card uses a Signetics 9401 CRC Generator/Checker IC. The Signetics 9401 is first preset to all zeros, and then calculates the CRC from the transmitted message. At the completion of the calculation, the CRC characters are appended to the end of the transmitted message. The receiver also calculates CRC characters with the received message and the transmitted CRC. For a good transmission, the CRC characters will equal 0000 (hex). With the current SDLC standard, the DVME-704 Serial Communication Controller in the RDM (Z8530) generates inverted CRC characters. The receiver calculates CRC characters with the received message and the transmitted CRC. For a good transmission, the CRC characters will equal F0B8 (hex).

6.3.5 Data Formats

The RDBM (Figure 6-1) operates as a remote device by providing Communication Transmitter Adapter (CTA)/Communication Receiver Adapter (CRA) serial I/O compatible with the data modems. The RDBM's CTA transmits input data to the RDM and the RDBM's CRA receives data from the RDM.

Four types of message words are used by the RDBM to communicate with the RDM and display: function command words from the RDM, message words sent to the RDM, input message words from the display keyboards, and output message words to the display.

6.3.5.1 RDM to RDBM Function Commands

All RDBM operations are initiated by the RDMs. Commands are received serially via the modem and processed by the CRA. The function code field, bits 12 through 14 of the second word of the message, determines the operation to be performed by the RDBM.

1. Function Code 0

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	OMN			N				PP						C	S
P	0	0	0	N			KFC					KBD		MS	

PP = Preview pointer
P = Parity bit
OMN = RDM output message number
C = Channel capture (causes RDBM to transmit on the same channel that the capture channel function was received on)
S = RDBM restart
KFC = Keyboard function code (refer to Table 6-2 for field description)
KBD = Keyboard number
MS = MSAW alarm
Bit 0=1 off
Bit 1=1 on
N = Not used

2. Function Code 1 - Function code 1 has three different message formats determined by the subfunction field.

   a. Subfunctions 0 and 1 (Load Refresh Memory)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	OMN			SF			WORD COUNT					INCREMENT			
P	0	0	1	STARTING ADRS											
P	DATA WORD														
P	DATA WORD														

P = Parity bit
OMN = RDM output message number
SF = Subfunction
= 0 normal load
= 1 normal load, store redundant A-word at end
WORD COUNT = Number of data words in message
INCREMENT = Increment count
STARTING ADRS = Starting refresh memory address

   b. Subfunctions 2, 3, and 4 (Move Function)

TABLE 6-4. FUNCTION CODE 0 - KEYBOARD FUNCTION CODES

KEYBOARD FUNCTION CODE BINARY	OCTAL	DESCRIPTION
00000	0	No function - RBP does not require maintenance of the preview area.
00001	1	Clear preview area - Causes RDBM to erase from the preview area any data entered from the keyboard specified in the KBD field.
00010	2	Clear preview area, save function area - Causes RDBM to erase from the preview area all data entered from the keyboard specified in the KBD field except for the first four characters, which may contain a function entry. Function entry is made via a special bank of keys on the display, which are used in communication with the RBP.
00011	3	Clear readout area - Causes RDBM to erase from the readout area any data entered from the keyboard specified in the KBD field.
00100	4	Clear readout and preview areas - Causes RDBM to erase from the readout and preview areas any data entered from the keyboard specified in the KBD field.
00101	5	Clear readout and preview areas, save function area - Causes RDBM to erase from the preview and readout areas all data entered from the keyboard specified in the KBD field except for the first four characters, which may contain a function entry.
00110	6	Illegal function - Causes RDBM to put ILL FNCT in the readout area established by the RBP for the keyboard specified in the KBD field.
00111	7	Capacity - Causes RDBM to put CAPACITY in the readout area established by the RBP for the keyboard specified in the KBD field.
01000	10	Illegal track - Causes RDBM to put ILL TRK in the readout area established by the RBP for the keyboard specified in the KBD field.
01001	11	Illegal position - Causes RDBM to put ILL POS in the readout area established by the RBP for the keyboard specified in the KBD field.
01010	12	Illegal line - Causes RDBM to put ILL LINE in the readout area established by the RBP for the keyboard specified in the KBD field.
01011	13	Format error - Causes RDBM to put FORMAT in the readout area established by RBP for keyboard specified in the KBD field.
01100	14	No slew - Causes RDBM to put NO SLEW in the readout area established by the RBP for the keyboard specified in the KBD field.
01101	15	Duplicate identify - Causes RDBM to put DUP ID in the readout area established by the RBP for the keyboard specified in the KBD field.
01110	16	Duplicate beacon - Causes RDBM to put DUP BCN in the readout area established by the RBP for the keyboard specified in the KBD field.
01111	17	No input - Causes RDBM to put NO INPUT in the readout area established by the RBP for the keyboard specified in the KBD field.
10000	20	Interfacility wait - Causes RDBM to put IF WAIT in the readout area established by the RBP for the keyboard specified in the KBD field.
10001	21	Unlock keyboard - Causes RDBM to allow keyboard entries to be made on the keyboard specified in the KBD field. The keyboard is locked when ENTER or trackball enter are pressed, allowing the RBP to respond to the keyboard message.
10010	22	Reset preview pointer - Causes RDBM to set its preview pointer to value specified in PP field. The next keyboard-entered character will be placed at the location specified by this preview pointer value.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	OMN			SF			WORD COUNT					N			
P	0	0	1	DESTINATION ADDRESS (B)											
P	NW														
P	SOURCE ADDRESS (A)														

P = Parity bit
OMN = RDM output message number
SF = Subfunction
=2 move forward
=3 move backward
=4 move forward, store redundant A-word
NW = Number of words to move
N = Not used
WORD COUNT = Number of data words in message

c. Subfunction 7 (Load Keyboard Function Table)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	OMN			1	1	1	N					N			
P	0	0	1	N											
P	N			F1 CHAR 1						F1 CHAR 2					
P	N			F2 CHAR 1						F2 CHAR 2					
≈															≈
P	N			F15 CHAR 1						F15 CHAR 2					
P	N			F16 CHAR 1						F16 CHAR 2					

P = Parity bit
OMN = RDM output message number
F1 through F16 = Keyboard function keys 1 through 16
N = Not used

3. Function Code 2 (Retransmit/Enable Keyboard)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	OMN			N											R
P	0	1	0	N									IMN		

P = Parity bit
OMN = RDM output message number
R = 0 - enable keyboards
= 1 - retransmit request for IMN
IMN = RDBM message number to be retransmitted
N = Not used

4. Function Code 3 (Display Disable/Diagnostic Select)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	OMN			N									D	DS	
P	0	1	1	N											

P = Parity bit
OMN = RDM output message number
D = 1 - disable display input and output transfer
DS = Diagnostic select
Bit 0=1 transfer control to a display diagnostic
Bit 1=1 transfer control to RDBM diagnostic
N = Not used

5. Function Code 4 (Initialization Addresses and Test Commands)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	OMN			AD							KBD		RB		
P	1	0	0	ADDRESS OR PARAMETER											

P = Parity bit
OMN = RDM output message number
AD = Address or parameter type (see Table 6-3 for field description)
KBD = Keyboard number
RB = Readback/test request field (octal)
= 0 - No readback or test
= 1 - Readback refresh memory
= 2 - Do end-around test, Channel A
= 3 - Do end-around test (can be used instead of RB = 2), Channel B
= 4 - Reserved for display test
= 5, 6, and 7 - Not defined

6. Function Code 5 (Refresh Starting Address)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	OMN			N											
P	1	0	1	STARTING ADDRESS											

P = Parity bit
OMN = RDM output message number
N = Not used

7. Function Code 6 (Initial P-Stack Point)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	OMN			N											
P	1	1	0	P_{UPPER}						P_{LOWER}					

P = Parity bit
OMN = RDM output message number
P_{UPPER} = Most significant 6-bits of the address of the P-stack established by the RDM in refresh memory
P_{LOWER} = Least significant 6-bits of the address of the P-stack established by the RDM in refresh memory.

8. Function Code 7 (Modify P-Stack Word)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	OMN			LIST ADDRESS											
P	1	1	1	STACK ADRS						POINTER VALUE					

P = Parity bit
OMN = RDM output message number
LIST ADDRESS = Is a value inserted in the P-stack word
POINTER VALUE = Is a value inserted in the P- stack word
STACK ADRS = Contains the location within the P- stack to modify

TABLE 6-5. FUNCTION CODE 4 - AD FIELD DESCRIPTION

AD FIELD		
BINARY	OCTAL	DESCRIPTION
0000000	0	No address or parameter.
0000001	1	Range ring sublist address - Indicates that the ADDRESS or PARAMETER field contains the refresh memory address of the P-stack word containing the address of the display words which are generating the range rings.
0000010	2	2 nm range ring A-word address
0000011	3	5 nm range ring A-word address
0000100	4	10 nm range ring A-word address The three range ring settings are selected on the keyboard. The RDBM outputs data ac cording to this selection. The RDM establishes data in refresh memory for all three settings and the RDBM sets the P-stack pointer to the proper range ring A-word address.
0000101	5	System data A-word address - Indicates that the ADDRESS or PARAMETER field contains the location in refresh memory of system data stored by the RDM. This enables the RDBM to store new x and y coordinates for the system data when a keyboard entry is made to move the system data.
0000110	6	Preview/readout A-word address - Indicates that the ADDRESS or PARAMETER field con tains the address of the beginning of the readout and preview area in refresh memory.
0000111	7	Trackball A-word address - Indicates that the ADDRESS or PARAMETER field contains the location in refresh memory established by the RDM for the trackball display words. This address is used to update the trackball position.
0001000	10	Arrival/departure list A-word address - Indicates that the ADDRESS or PARAMETER field contains the address in refresh memory containing the arrival/departure list.
0001001	11	Coast/Suspend list A-word address - Indicates that the ADDRESS or PARAMETER field contains the address in refresh memory containing the coast/suspend list.
0001010	12	Trackball symbol - Indicates that the trackball symbol is given in bits 0 through 6 of the AD DRESS or PARAMETER field.
0001011	13	Length of readout area - Indicates that the value in the ADDRESS or PARAMETER field is the length of the readout area in refresh memory used by the RDBM to determine the begin ning of the preview area.
0001100	14	Maximum number of characters in preview area - Indicates that the ADDRESS or PA RAMETER field contains the number of characters in the preview area.
0001101	15	Move trackball in radar coordinates - Indicates to the RDBM that the trackball should be moved in the radar coordinate system.
0001110	16	Move trackball in display coordinates - Indicates to the RDBM that the trackball should be moved in the display coordinate system.
0001111	17	Enable range rings - Commands the RDBM to display the range rings generated by the RDM.
0010000	20	Disable range rings - Commands the RDBM to not display the range rings generated by the RDM.

6.3.5.2 RDBM to RDM Message Formats

Messages are sent by the RDBM to the RDM as a result of keyboard entries, error conditions in the display or adapter interface, and as a response to RDM requests. The eight message types are as follows:

Message Type	Description
0	Status Message
1	Acknowledge/Retransmit Message
2	RDBM Restart Message
3	Keyboard Quick Look Data Message
4	Trackball Data Message
5	Trackball and Preview Data Message
6	Preview Data
7	Readback Data Message

The message type number is given in bits 11 through 13 of the first word following the flag word. This word also contains the message number (MN field) and the half-word count (HWC field), which indicates the number of 16-bit words in the message. Certain message types use the remaining bits in this word to provide additional data to the RDM. These fields are described in the message descriptions.

1. Message Type 0 (Status Message) - A status word is transferred to the RDM following the message type word with the contents of the MT field equal to 000. The status word indicates that the error conditions have been detected by the RDBM, or that an interrupt word has been received from the display subsystem. Reference Figure 6-3 and Table 6-6.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
P	N	0	0	0	MN			HWC					N			MESSAGE TYPE WORD
P	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	STATUS WORD

DISPLAY INPUT DATA OUT OF SYNCH
CRA DATA SET ALARM
DISPLAY OUTPUT DATA PARITY ERROR
NO DISPLAY INPUT DATA REQUEST
NO DISPLAY OUTPUT DATA REQUEST
CTA-A PARITY ERROR
NO DATA RECEIVED FROM THE ARTS IIIE
CTA-B PARITY ERROR
TEMP STORAGE PARITY ERROR
INPUT TIMING ERROR
OUTPUT TIMING ERROR
OUT OF SYNCHRONIZATION
RDBM OUTPUT DATA PARITY ERROR
RDBM INPUT DATA PARITY ERROR
STATUS WORD TYPE IDENTIFIER
PARITY (ODD)

P*=*PARITY
MN*=*MESSAGE NUMBER
HWC*=*HALF-WORD COUNT
N*=*NOT USED

FIGURE 6-3. STATUS WORD FORMAT TRANSFERRED TO THE RDM

TABLE 6-6. STATUS WORD BIT DESCRIPTIONS

BIT	DESCRIPTION
0	Display input data out of synch - Indicates input data from the display (type 1 and type 2 words) received out of order.
1	CRA data set alarm - Indicates that a data quality detector signal has been received from a modem capable of monitoring data quality and its own performance.
2	Display output data parity error - Indicates that a parity error has been detected by the display at its output data interface to the RDBM.
3	No display input data request - Indicates that no display input data requests have been received from the display within one minute after inputs are enabled or after the previous input data request.
4	No display output data request - Indicates that no display output requests have been received from the display within one minute after the refresh mode is enabled or after the previous output data request.
5	CTA-A parity error - Indicates that a parity error has been detected in a parallel data word received from the microprocessor by the CTA for channel A.
6	No data received from the ARTS IIIE - Indicates that no data has been received from the DP subsystem for approximately four seconds.
7	CTA-B parity error - Same as bit 5 for channel B.
8	Temporary storage parity error - Indicates that a parity error was detected in a data transfer from temporary storage to refresh memory.
9	Input timing error - Indicates that the microcontroller has failed to accept and acknowledge a parallel data word transfer from the active CRA in time to prevent loss of the next serial input data word.
10	Output timing error - Indicates that the parallel transfer rate from the microcontroller to the active CTA is inadequate to maintain a continuous serial message output at the modem or RDBM test clock rate.
11	Out of synchronization - Indicates that the active CRA failed to detect four non-flag bytes prior to flag detection (illegal or short message).
12	RDBM output data parity error - Indicates that a parity error has been detected at the output data interface between the RDBM and the display.
13	RDBM input data parity error - Indicates that a parity error has been detected at the input data in terface between the RDBM and the display.
14	Status word type identifier - When not set, indicates that the word is an operational status word with bits as defined in this table. When set, indicates that the word is a diagnostic status word.
15	Parity bit.

2. Message Type 1 (Acknowledge/Retransmit Message) - This message has two forms: an acknowledge message, sent in response to an RDM message, and a retransmit request, sent when a line error has occurred.

   a. Acknowledge/Retransmit Message

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P	A	0	0	1	MN			HWC					N		
P	N											X	OMN		

P = Parity bit
A = 1 - acknowledge message
0 - retransmit request
MN = Message number
HWC = Half-word count
X = RDBM input channel identifier
1 - message received on the channel selected by function code 0 from the ARTS IIIE
0 - message received on the channel not selected by function code 0
OMN = If an acknowledge message, indicates the RDM message number being acknowledged. If a retransmit request, indicates the RDM message number of the next expected message.
N = Not used

3. Message Type 2 (RDBM Restart Message) - The RDBM Restart message is used to inform the RDM that the RDBM is initialized. This format is also used to inform the RDM of a range and/or off center change.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
P	N	0	1	0	MN			HWC					N		R	
P	N	OFF-CENTER Y								OFF-CENTER X						
P	N									RANGE						
P	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	KEYBOARD
											KEYBOARD 3					QUICK
						KEYBOARD 2										LOOK
	KEYBOARD 1															SWITCHES

P = Parity bit
MN = Message number
HWC = Half-word count
R = 0 - RDBM restart
1 - range/off-center change only
OFF-CENTER X, Y = display off-center X and Y (LSB = 1/32 NM) - indicate off-center coordinates
RANGE = Display range (LSB = 1 NM) - indicates the selected display range
KEYBOARD QUICK LOOK SWITCHES = Indicators for quick look switches on all three keyboards
N = Not used

4. Message Type 3 (Keyboard Data Message) - The quick look message is used to transfer the quick look data from all keyboards to the RDM.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
P	N	0	1	1	MN			HWC					N			MESSAGE TYPE WORD
P	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	QUICK LOOK SWITCHES
	KEYBOARD 1					KEYBOARD 2					KEYBOARD 3					

P = Parity bit
MN = Message number
HWC = Half-word count
KEYBOARD QUICK LOOK SWITCHES = Indicators for quick look switches on all three keyboards
N = Not used

5. Message Type 4 (Trackball Data Message) - The trackball enter message is used to transfer the position of the trackball to the RDM upon command from the trackball enter switch. The format of the trackball enter data word(s) is the same as the B type refresh data word used to position the trackball symbol on the display screen.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	P	MF	1	0	0	MN			HWC					KI		N	MESSAGE TYPE WORD
	P	N				SUBFUNCTION						FN					TRACKBALL ENTER DATA WORD
B-WORD FORMAT	P	Y POS											0	X POS			
	P	X POS								S	N						
B-WORD FORMAT	P	Y POS											0	X POS			PRESENT ONLY IF S = 1
	P	X POS								N							

P = Parity bit
MF = 1 - keyboard is in the multifunction mode
MN = Message number
HWC = Half-word count
KI = Keyboard index - indicates the number (1 through 3) of the keyboard where this message originated
SUBFUNCTION = Indicates which list was referenced by the keyboard
31 = readout/preview list
34 = system data list
35 = arrival/departure list
14 = coast/suspend list
FN = Function number - indicates which keyboard function key was entered
X POS, Y POS = X and Y coordinates of the trackball associated with the keyboard data (LSB = 1/16 NM)
S = 0 - 1 trackball entered
1 - 2 trackball entered
N = Not used

6. Message Type 5 (Trackball and Preview Data Message) - The trackball enter and preview data are used to transfer the position of the Trackball and Preview Data message to the RDM upon command from the trackball enter switch. The format of this message is the word with the number of lines and the number of characters in the preview data, followed by the trackball position B-type refresh data word, followed by the required number of C type refresh data words which contain the entire preview area data.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	P	MF	1	0	1	MN			HWC					KI		M	
	P	NL				NC						FN					
B-WORD FORMAT	P	Y POS											0	X POS			
	P	X POS								S	FIRST SLEW						
B-WORD FORMAT	P	Y POS											0	X POS			PRESENT ONLY IF S = 1
	P	X POS								N							
C-WORD FORMAT	P	PC_1						PC_2						PC_3			
	P	PC_3			PC_4						PC_5						
≈																	≈
C-WORD FORMAT	P	PC_{n-4}						PC_{n-3}						PC_{n-2}			
	P	PC_{n-2}			PC_{n-1}						PC_n						

P = Parity bit
MF = 1 - keyboard is in the multifunction mode
MN = Message number
HWC = Half-word count
KI = Keyboard index - indicates the number (1 through 3) of the keyboard where this message originated
M = MSB of number of lines preview area
NL = LSBs of number of lines in preview area
NC = Number of characters in preview area
FN = Function number - indicates which keyboard function key was entered
X POS, Y POS = X and Y coordinates of the trackball associated with the keyboard data (LSB = 1/16 NM)
PC_n = nth preview character
N = Not used
FIRST SLEW = Initial or only entry of the slew
S = 0, 1 slew

7. Message Type 6 (Preview Data Message) - The Preview Only message is used to transfer the Preview Data message to the RDM upon command from the keyboard enter switch. The format of this message requires a number of C-type refresh data words that contain the entire preview area data.

	15	14	13	12	1	10	9	8	7	6	5	4	3	2	1	0
	P	MF	1	1	0	MN			HWC					KI		M
	P	NL				NC					FN					
C-WORD	P	PC1						PC2						PC3		
FORMAT	P	PC3			PC4						PC5					
C-WORD	P	PCn-4						PCn-3						PCn-2		
FORMAT	P	PCn-2			PCn-1						PCn					

P = Parity bit
MF = 1 - keyboard is in the multifunction mode
MN = Message number
HWC = Half-word count
KI = Keyboard index - indicates the number (1 through 3) of the keyboard where this message originated
M = MSB of number of lines preview area
NL = LSBs of number of lines in preview area
NC = Number of characters in preview area
FN = Function number - indicates which keyboard function key was entered
PC_n = nth preview character

8. Message Type 7 (Readback Data Message) - This message shall perform two functions depending on the value of the T bit:

   a. The Readback End-Round Test Results (T=1) message shall be:

      - Used to return end-round test results data to the AS
      - Sent on preferred channel when the end-round test (internal loopback test) is completed.

   b. The Readback Refresh Memory (T=0) message shall be:

      - Used to return requested refresh memory content
      - Sent when requested by the AS with the Readback Refresh Memory message.

The DATA transfers words previously stored in the display refresh memory or the self-test message received as a result of an end-around test request (Function Code 4).

15	14	13	12	1	10	9	8	7	6	5	4	3	2	1	0
P	MF	1	1	1	MN			HWC					N		
P	T	N		STARTING ADDRESS											
P	READBACK DATA MSB														
P	READBACK DATA LSB														
P	READBACK DATA LSB														

P = Parity bit
MF = 1 implies keyboard is in the multifunction mode
MN = Message number
HWC = Half-word count (=6, end-around) or (=30, readback data)
T = 1 - end-around test result
0 - readback data
STARTING ADDRESS = Starting refresh memory address, not used when end-around test results are returned
N = Not used
HWC = Half-word count

Section 7
WWVB TIME CODE SIGNAL

7.1 GENERAL DESCRIPTION

The WWVB time code signal is an external interface to the ARTS for the ARTS IIIE configuration system. The time code is received at the ARTS IIIE system via an antenna, preamplifier, and WWVB receiver. This interface is not used in the ARTS IIE terminal sites.

7.2 REFERENCED DOCUMENTS

7.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

7.2.1.1 Applicable Government Documents

Specifications

None.

Standards

None.

Other Publications

Special Publication 432	National Bureau of Standards Time and Frequency Dissemination Services

7.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

None.

Other Publications

ATC 61014	Hardware Top-Level Design Document (CDRL E004)

7.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the document referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052	ARTS IIIE Upgrade to Selected Air Traffic Control Facilities, Modification 8, 31 December 1993

FAA Specifications

FAA-E-2759 ARTS IIIE System Functional Specification, 13 August 1993

FAA Computer Program Functional Specifications

None.

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None

7.3 WWVB TIME CODE DESCRIPTION

7.3.1 General Information

The National Institute of Standards and Technology (NIST) radio station WWVB, located in Fort Collins, Colorado (latitude 40 degrees, 41 minutes, 28.3 seconds North; longitude 105 degrees, 02 minutes, 39.5 seconds West), transmits a modified Inter-Range Instrumentation Group (IRIG) H time code with a power of 13 KW. The modified IRIG H time code is binary coded decimal (BCD) with a one-minute time frame. The code is broadcast continuously and is synchronized with the 60-kHz carrier signal.

7.3.2 Mechanical Characteristics

An antenna is located at the Air Traffic Control facility to receive the WWVB time code signal.

7.3.3 Electrical Characteristics

The time information is broadcast using a level-shift carrier time code.

7.3.4 Protocol

Not applicable.

7.3.5 Data Format

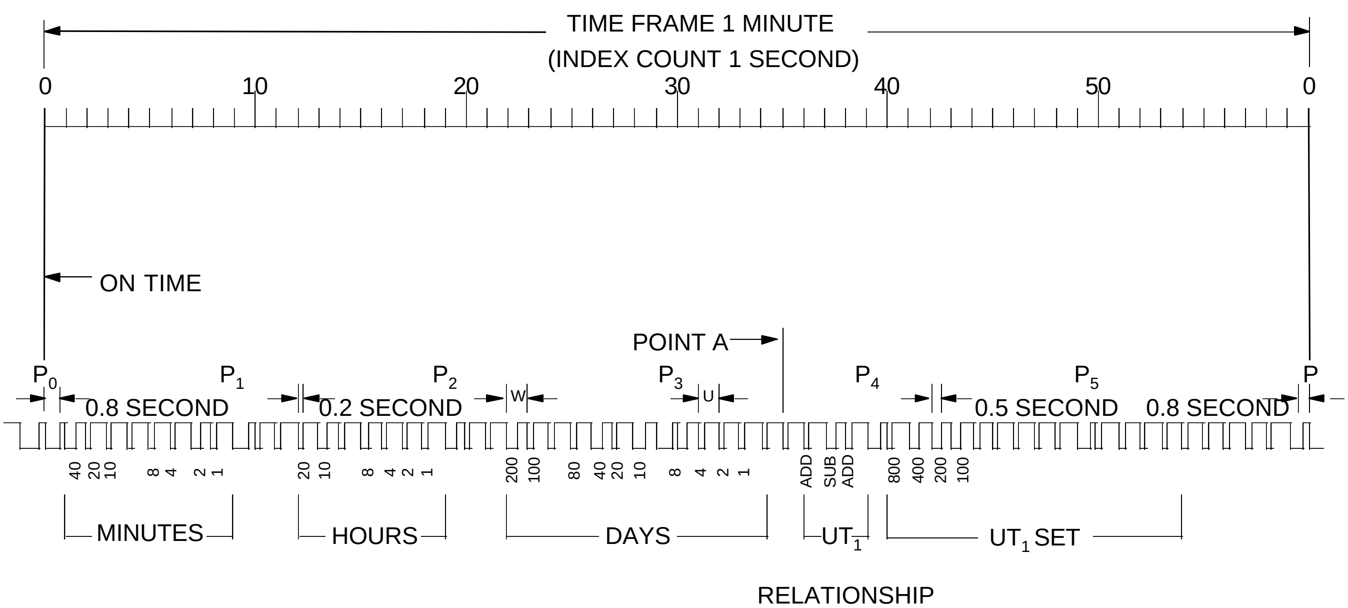
As shown in Figure 7-1, the signal consists of 60 markers each minute, with one marker each second. (Time progresses from left to right.) Each marker is generated by reducing the power of the carrier by 10 dB at the beginning of the corresponding second and restoring it:

1. 0.2 second later for an uncoded marker or binary 0.
2. 0.5 second later for a binary 1.
3. 0.8 second later for a 10-second position marker or for a minute reference marker.

The 10-second position markers, labeled P0 through P5 on the diagram, occur respectively as the 59th, 9th, 19th, 29th, 39th, and 49th second pulses of each minute. The minute reference marker begins at zero seconds. Uncoded markers occur periodically as the 4th, 14th, 24th, 34th, 44th, and 54th second pulses and also as the 10th, 11th, 20th, 21st, 35th, 55th, 56th, 57th, and 58th second pulses of each minute. Thus, every minute contains 12 groups of five markers, each group ending with either a position marker or an uncoded marker.

Each minute, the code presents time-of-year information in minutes, hours, day-of-the-year, and the actual milliseconds difference between the time as broadcast and the best known estimate of UT_1. The first two BCD groups in the minute specify the minute of the hour; the third and fourth BCD groups make up a set that specifies the hour of the day; the fifth, sixth, and seventh groups form a set that specifies the day-of-the-year. A set made up of the 9th, 10th, and 11th BCD groups specifies the number of milliseconds to be added to or subtracted from the code time as broadcast in order to obtain UT_1. The relationship of the UT_1 scale to the time as coded is indicated in the eighth group. If UT_1 is "slow" with respect to the code time, a binary "one," labeled SUB (subtract) in Figure 7-1, will be broadcast in the eighth group during the 38th second of the minute. If UT_1 is "fast" with respect to the code time, a binary "one," labeled ADD in Figure 7-1, will be broadcast in the eighth group during the 37th and 39th seconds of the minute. The 12th group is not used to convey information.

When used to convey numerical information, the four coded markers used as digits in a BCD group are indexed 8-4-2-1, in that order. Sometimes only the last two or three of the coded markers in a group are needed, as in the first groups in the minutes, hours, and days sets. In these cases, the markers are indexed 2-1 or 4-2-1, accordingly. The indices of the first group in each set that contains two groups are multiplied by 10. Those of the second group of such a set are multiplied by 1. The indices of the first group in each set that contains three groups are multiplied by 100; those of the second group are multiplied by 10, and those of the third group by 1. A specific example is indicated in Figure 7-1.



1 PPM FRAME REFERENCE MARKERS	
BINARY CODED DECIMAL TIME-OF-YEAR CODE WORD (23 DIGITS)	TIME AT POINT A
CONTROL FUNCTIONS (15 DIGITS) USED FOR UT_1 CORRECTIONS	258 DAYS
6*PPM POSITION IDENTIFIER MARKERS AND PULSES (P_0 THROUGH P_5	18 HOURS
*(REDUCED CARRIER 0.8 SECOND DURATION PLUS 0.2 SECOND DURATION PULSE)	42 MINUTES
W - WEIGHTED CODE DIGIT (CARRIER RESTORED IN 0.5 SECOND - BINARY ONE)	34.3 SECONDS
U - UNWEIGHTED CODE DIGIT (CARRIER RESTORED IN 0.2 SECOND - BINARY ZERO)	

FIGURE 7-1. WWVB TIME CODE FORMAT

The occurrence of two binary 1's in the minutes set indicates that the minute contemplated is the 40 + 2 = 42nd minute. Similarly, the two binary 1's in the hours set indicate the 10 + 8 = 18th hour of the day, while the four binary 1's in the days set indicate the 200 + 40 + 10 + 8 = 258th day of the year.

It is seen from the UT_1 Relationship group and the UT_1 Set that one should subtract, from any second in this minute, 400 + 200 + 100 = 700 milliseconds to get an estimate of UT_1. For example, the 35th UT_1 interval would end 700 milliseconds (or 0.7 seconds) later than the end of the 35th second. In other words, the UT_1 scale reading for the end of the 35th second would be 18h 42m 34.3s, because 35.0s - 0.7s = 34.3s.

Additional detailed information is available in the NIST Publication #432. This publication is available from: Time and Frequency Division Institute for Basic Standards NIST Boulder, Colorado 80303.

Section 8
ARTS PD-PC LAN INTERFACE

8.1 GENERAL DESCRIPTION

The Performance Data-Personal Computer (PD-PC) interface is the external interface of the ARTS used in the ARTS IIIE configuration that is a network interface for performance data gathering equipment and the System Monitoring Console Personal Computers. A block diagram of the PD-PC interface is shown in Figure 8-1.

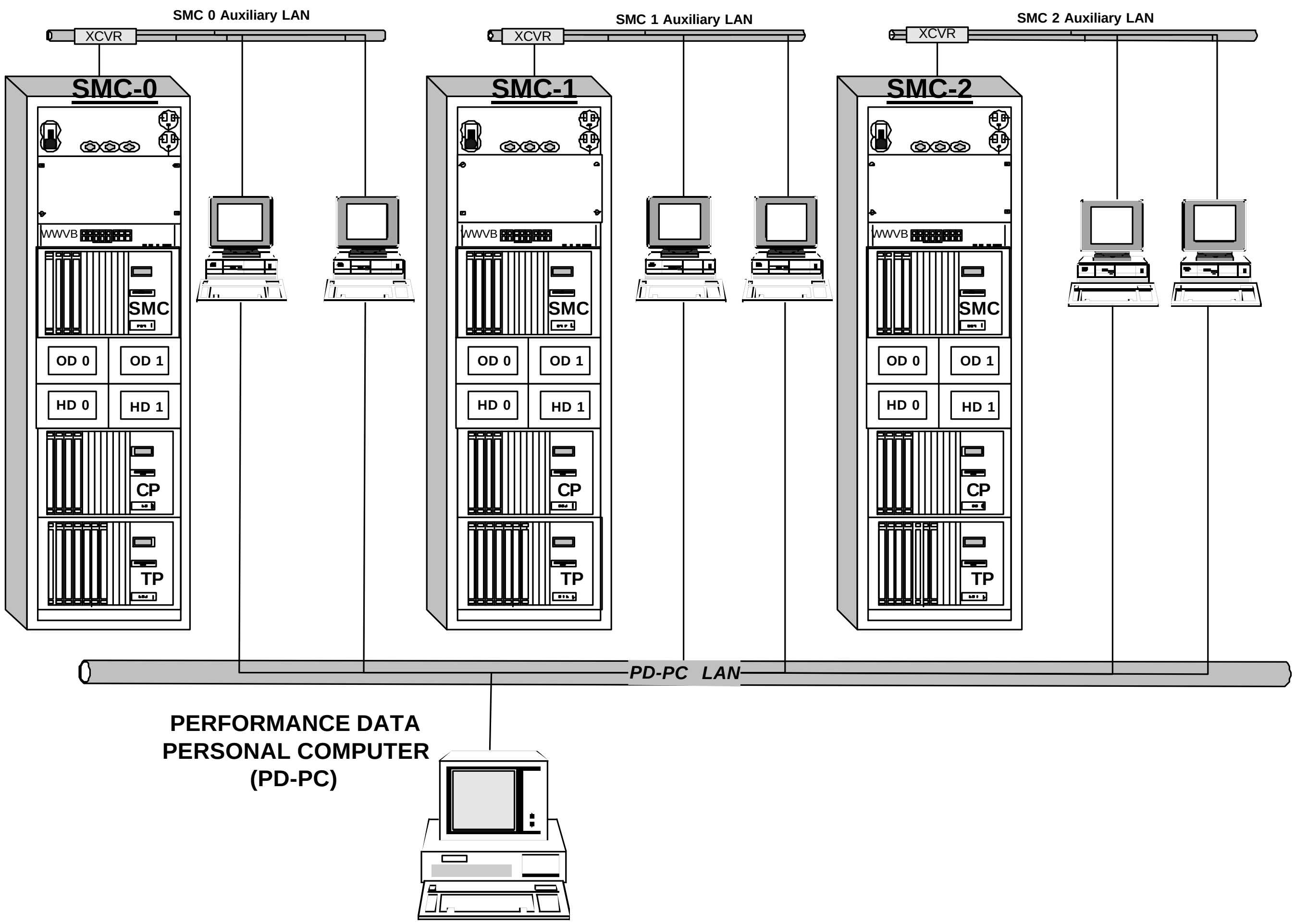


FIGURE 8-1. ARTS IIIE PD-PC LAN INTERFACE

8.2 REFERENCED DOCUMENTS

8.2.1 Applicable Documents

The following documents shown form a part of this document to the extent described herein. In the event of conflict between the document referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

8.2.1.1 Applicable Government Documents

Specifications

None.

Standards

None.

Other Publications

None.

8.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

ANSI/IEEE 802.3a-1988 ISO/DIS 8802/3	IEEE Standard for Local Area Networks Carrier Sensing Multiple Access/Collision Detection (CSMA/CD) (10BASE2)

Other Publications

Microsoft Workgroup	Connection User's Group

8.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052	ARTS IIIE Upgrade To Selected Air Traffic Control Facilities, Modification 8, 31 December 1993

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993

FAA Computer Program Functional Specification

None.

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

8.3 PERFORMANCE DATA PERSONAL COMPUTER NETWORK INTERFACE DESCRIPTION

8.3.1 General Information

This PD-PC LAN interface to PD-PC and each PC on each SMC consists of a ETHERNET plug-in printed circuit assembly, located in each of the PCs. The network interface capabilities of each of the PCs provide the interface for the PD-PC to gather performance data from any of the SMCs.

8.3.2 Mechanical Characteristics

The connectors for the ETHERNET 10BASE2 interface are on the rear of the PC. The external network connector on the circuit card is a BNC. The cable type used is RG-58/u. Each connection to the PC is made with the use of a Tee Type BNC connector.

Cable pinning for the ETHERNET interface is shown in Table 8-1.

TABLE 8-1. ETHERNET CONNECTIONS

PIN	FUNCTION
SHIELD	GROUND
CENTER	TRANSMIT DATA

8.3.3 Electrical Characteristics

Signals are as specified in ANSI/IEEE 802.3-1985 IEEE Standard for Local Area Networks Carrier Sensing Multiple Access/Collision Detection (CSMA/CD)ISO/DIS 8802/3.

8.3.4 Protocol

The protocol is accomplished through Commercial Off-The-Shelf (COTS) software by Microsoft. The SMC PCs and the PD-PC will be running Windows NT Version 3.1 or later by Microsoft.

Section 9
TRAFFIC MANAGEMENT SYSTEM INTERFACE

9.1 GENERAL DESCRIPTION

The Traffic Management System (TMS) interface is the external interface of the ARTS used in the ARTS IIIE configuration providing local track data to the Department of Transportation's TMS. This transmitted data is in the form of TZ messages. A block diagram of the TMS interface is shown in Figure 9-1. This interface is not used in the ARTS IIE configurations.

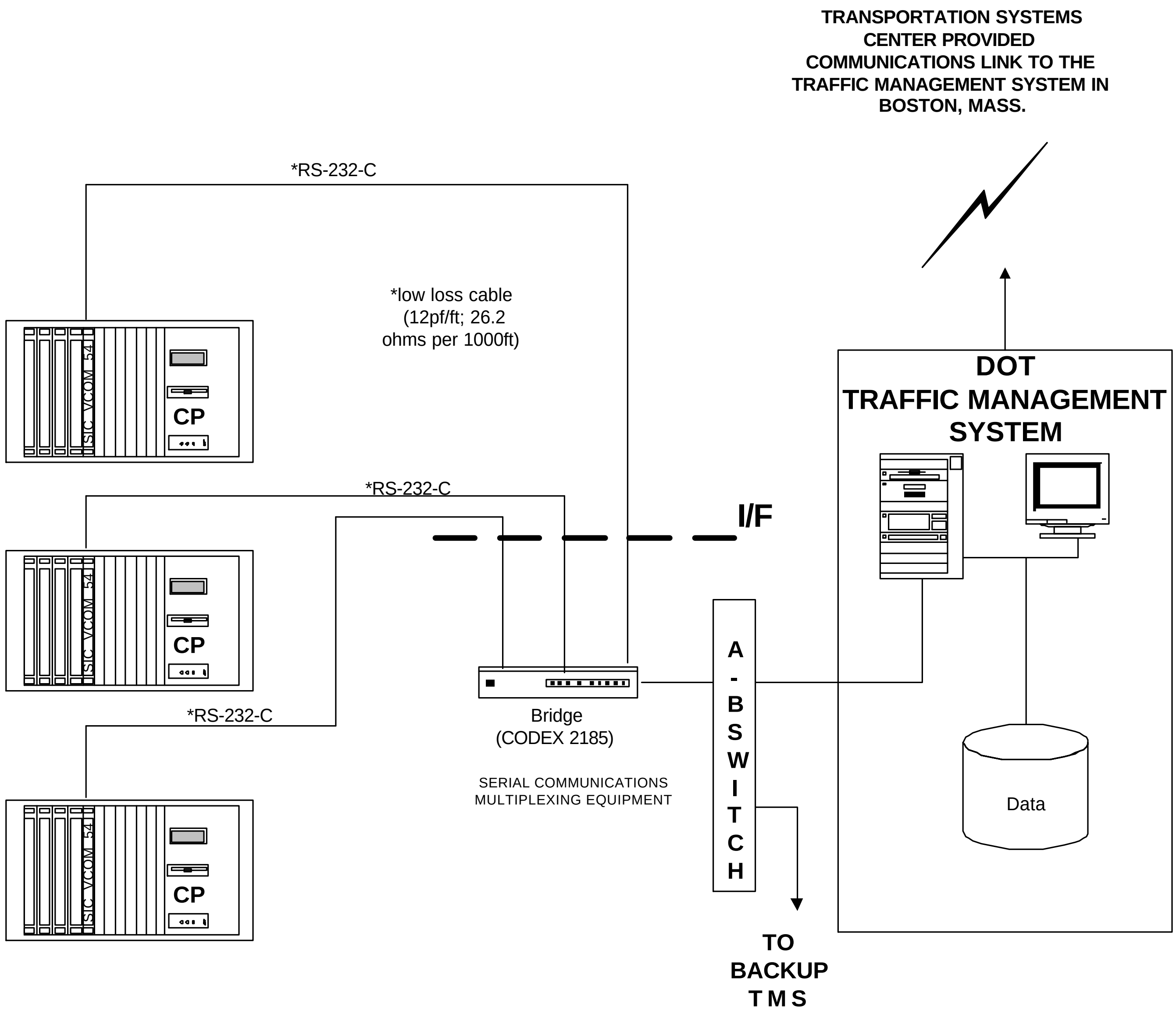


FIGURE 9-1. ARTS/TMS INTERFACE

9.2 REFERENCED DOCUMENTS

9.2.1 Applicable Documents

The following documents shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

9.2.1.1 Applicable Government Documents

Specifications

None.

Standards

None.

Other Publications

None.

9.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

EIA-RS-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Exchange

Other Publications

NAS-IC-90062400	Interface Control Document ARTS Traffic Management Interface Subsystem (ATMIS)/Traffic Management System, 22 March 1994, Revision B

9.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052	ARTS IIIE Upgrade To Selected Air Traffic Control Facilities, Modification 8, 31 December 1993

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993

FAA Computer Program Functional Specification

NAS-MD-315	NAS En Route Computer Program Functional Specification, Remote Outputs

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

9.3 TRAFFIC MANAGEMENT SYSTEM SERIAL INTERFACE DESCRIPTION

9.3.1 General Information

The serial interface between the ARTS and the TMS is provided by each Common Processor (CP) via RS-232 interface. This connects the RS-232 interfaces to a GFE Digital Bridge (e.g., CODEX 2185) which provides an connection to the TMS. This interface is only used by the ARTS IIIE configuration.

9.3.2 Mechanical Characteristics

Cable pinning for the CP to RS-232 TMS interface is shown in Table 9-1.

TABLE 9-1. ARTS CP TO BRIDGE

TMS PIN (DCE)	FUNCTION	CP EQUIPMENT (DTE)
1	Protective Ground(SG)	1
2	Transmit Data(BA)	2
3	Receive Data(BB)	3
7	Request to Send(CA)	7
4	Signal Ground(AB)	4

9.3.3 Electrical Characteristics

Signals are as specified in EIA-RS-232.

9.3.4 Protocol

The interface protocol between the ARTS and TMS will be asynchronous, ASCII control/data characters using XON(DC1)(11 hex)/XOFF(DC3)(13 hex) for flow control. The transmitted characters will include 1 Start bit, 8 Data bits, odd parity bit, and 1 Stop bit.

Each message transmitted will begin with the ASCII Start of Text (STX)(02 hex) character and end with the ASCII End of Text (ETX)(03 hex) character. The ARTS will recognize the XOFF control character received from the TMS to stop data transmissions to the TMS. The ARTS will resume data transmissions to the TMS when it receives the XON character from the TMS.

The ARTS will not send any characters to the TMS between <etx> and <stx> (i.e., idle time).

9.3.5 Interface Data Rate

The interface data rate between the ARTS and TMS will be 19,200 bits-per-second (bps). It shall be possible to change this data rate to 2400, 4800, 9600, or 19,200 bps.

9.4 DATA FORMATS

The following paragraphs defines the messages transmitted between the ARTS and the TMS.

9.4.1 ARTS to TMS Messages

9.4.1.1 Flow Control Track/Full Data Block Information (TZ) Message

The Flow Control Track/Full Data Block Information (TZ) messages are used to provide the TMS with selected current track and full data block information. This message is similar to the NAS-MD-315 message format, however, since the ARTS/TMS interface is an asynchronous link (NAS interfacility is a synchronous interface), the message protocol is different from the NAS interfacility interface. The ARTS/TMS TZ message format is as follows:

Field Number	Field or Function	Description	Number of Bytes
00	Source ID	Addressor, message number - Lddd; where L = "L" and ddd incrementally increases with each message sent	4
	Field Separator	1 space	1
01	Message Type	2 Characters - TZ	2
	Field Separator	1 space	1
02	Aircraft Identification/ EnRoute computer ID (see note 2)	6 to 11 characters La(a)(a)(a)(a)(a)/dda	6-11
	Field Separator	1 space	1
05	Ground Speed	3 digits - ddd; if not available, ddd will be 3 zeros	3
	Field Separator	1 space	1
08	Reported Altitude	3 digits - ddd; in 100s of feet); if not available, ddd will be 3 zeros	3
	Field Separator	1 space	1
23	Track Position Coordinates (see note 3)	12 characters, latitude/ longitude in degrees/ minutes, ddddL/dddddL	12

Note 1: Not Used
Note 2: If the ECID is zero, no ECID has been assigned to this aircraft.

Note 3: ARTS positions are rounded to the nearest minute.
Only one TZ is sent to the TMS per message.
L= letter
d= digit

ARTS will send TZ messages to the TMS in 10 groups, with each group representing approximately 1/10 of the possible tracks. TZ messages will continue to be sent to the TMS for an aircraft as long as one of the ARTS systems is controlling the aircraft. New eligible tracks, well be in the next available group of tracks.

The time period between initialization of transmission of each group of 1/10 of the tracks will be a system parameter (set at 6 seconds, adjustable at run time from 3 to 30 seconds). This period will be known as the message initiation interval. This means that the time period between TZ messages for a single flight ID will be 30 to 300 seconds.

TZ messages will be sent to the TMS at a rate asynchronous to the ARTS track data update rate, which is at least once per radar scan (typically every 4.8 seconds). Thus, ARTS software will maintain a database of active aircraft that are controlled by the ARTS systems. TZ messages will be generated from this database for transmission to the TMS. To be eligible for transmission to the TMS, a track must be currently controlled by the ARTS system. When TZ messages are created, the latest positional data available for the controlled, active track will be used.

ARTS will expect to receive a DA (acceptance) or DR (rejection) message from the TMS for every TZ message sent to the TMS.

During periods of few tracks, there may be times when there are no TZ messages to be sent. To ensure that the ARTS interface is continuously operational, test messages will be sent periodically across the interface.

9.4.1.2 Test Message (TR)

The Test Message (TR) is used to transmit a message for interface testing ARTS to TMS. The TMS is expected to respond with a Data Test (DT) message, which verifies the interface is operational. The TR will be transmitted to the TMS every 30 {system parameter} seconds. The TR message format is as follows:

Field Number	Field or Function	Description	Number of Bytes
00	Source ID	Addressor, message number - Lddd; where L = "L" and ddd incrementally increases with each message sent.	4
	Field Separator	1 space	1
01	Message Type	2 Characters - TR	2
	Field Separator	1 space	1
16	Output Routing	3 characters LLL (XXX)	3
	Field Separator	1 space	1

11	Remarks	4 characters - TEST	4

9.4.1.3 Data Test (DT) Message

The DT message is transmitted from the ARTS to the TMS in response to receiving a TR message from the ARTS to validate that the ARTS/TMS interface is operational. The DT message format is as follows:

Field Number	Field or Function	Description	Number of Bytes
00	Source ID	Addresser, message number - Lddd; where L = “L” and ddd incrementally increases with each message sent.	4
	Field Separator	1 space	1
01	Message Type	2 Characters - DT	2
	Field Separator	1 space	1
25	Referent Message Descriptor	4 characters Lddd (from ARTS TR msg.)	4
	Field Separator	1 space	1
11	Remarks	4 characters - TEST	4

9.4.2 TMS to ARTS Messages

9.4.2.1 Data Test (DT) Message

The DT message is transmitted from the TMS to the ARTS in response to receiving a TR message from the ARTS to validate that the ARTS/TMS interface is operational. The DT message format is as follows:

Field Number	Field or Function	Description	Number of Bytes
00	Source ID	Addressor, message number - Lddd; where L = “L” and ddd incrementally increases with each message sent.	4
	Field Separator	1 space	1
01	Message Type	2 Characters - DT	2
	Field Separator	1 space	1
25	Referent Message	4 characters Lddd	4

	Descriptor	(from ARTS TR msg.)	
	Field Separator	1 space	1
11	Remarks	4 characters - TEST	4

9.4.2.2 Transmission Accepted (DA) Message

The DA message is transmitted from the TMS to the ARTS to acknowledge receipt of a valid TZ message from the ARTS. The DA message format is as follows:

Field Number	Field or Function	Description	Number of Bytes
00	Source ID	Addressor, message number - Lddd; where L = "X" and ddd incrementally increases with each message sent.	4
	Field Separator	1 space	1
01	Message Type	2 Characters - DA	2
	Field Separator	1 space	1
25	Referent Message Descriptor	4 characters Lddd (from ARTS TR msg.)	4

9.4.2.3 Transmission Rejected (DR) Message

The DR message is transmitted from the TMS to the ARTS in response to receiving an unacceptable TZ message from the ARTS. The DR message format is as follows:

Field Number	Field or Function	Description	Number of Bytes
00	Source ID	Addressor, message number - Lddd; where L = "X" and ddd incrementally increases with each message sent.	4
	Field Separator	1 space	1
01	Message Type	2 Characters - DR	2
	Field Separator	1 space	1
25	Referent Message Descriptor	4 characters Lddd (from ARTS TR msg.)	4

9.4.2.4 Test Message (TR)

The Test Message (TR) is used to transmit a message for interface testing ARTS/TMS. The ARTS is expected to respond with a Data Test (DT) message, which verifies the interface is operational. The TR will be transmitted to the ARTS every 30 {system parameter} seconds. The TR message format is as follows:

Field Number	Field or Function	Description	Number of Bytes
00	Source ID	Addressor, message number - Lddd; where L = "X" and ddd incrementally increases with each message sent.	4
	Field Separator	1 space	1
01	Message Type	2 Characters - TR	2
	Field Separator	1 space	1
16	Output Routing	3 characters LLL (XXX)	3
	Field Separator	1 space	1
11	Remarks	4 characters - TEST	4

9.4.3 Message Retransmission

ARTS to TMS TZ messages are retransmitted under the following conditions:

a. No response message is received from the TMS within 500 milliseconds {TMS_TZ_TIMEOUT} after transmission.

b. Receipt of a DR from the TMS.

If a DR is received, or no response is received within 500 milliseconds {TMS_TZ_TIMEOUT}, the TZ message will be recreated with the latest database information and resent to the TMS. After 3 milliseconds {TMS_TZ_RETRIES} DRs or timeouts, ARTS will abort transmission of the TZ for the current aircraft and sequence on to generating a TZ message and attempting transmission for the next eligible aircraft. This will ensure that the ARTS will continuously try to reinitiate the ARTS/TMS interface and it will also ensure that an unacceptable TZ message for one aircraft will not stop the flow of TZ messages for other aircraft to the TMS.

9.4.4 Example Message

The following are examples of ARTS to TMS messages:

<stx>L000 TZ NWA450/322 395 310 3723N/09027W<etx>
<stx>L001 TZ UAL27/761 391 350 4009N/10258W<etx>
<stx>L002 TR XXX TEST<etx>
<stx>L003 TZ AAL795/641 331 160 3536N/08838W<etx>

The following are examples of TMS to ARTS messages:

<stx>L000 DA L000<etx>
<stx>L001 DA L001<etx>
<stx>L002 DT L002 TEST<etx>
<stx>L003 DR L003<etx>

Section 10
DIGITAL ALTIMETER SETTING INDICATOR INTERFACE

10.1 GENERAL DESCRIPTION

The Digital Altimeter Setting Indicator (DASI) system senses the ambient pressure altitude and accurately converts this pressure into altimeter setting in inches of mercury which is displayed on local and/or remote DASI Display units. The DASI system also interfaces with the ARTS to provide the ARTS with automatic altimeter setting data over a low speed serial data link. Figure 10-1 is the functional diagram of this interface. This interface is only used by the ARTS IIIE configuration.

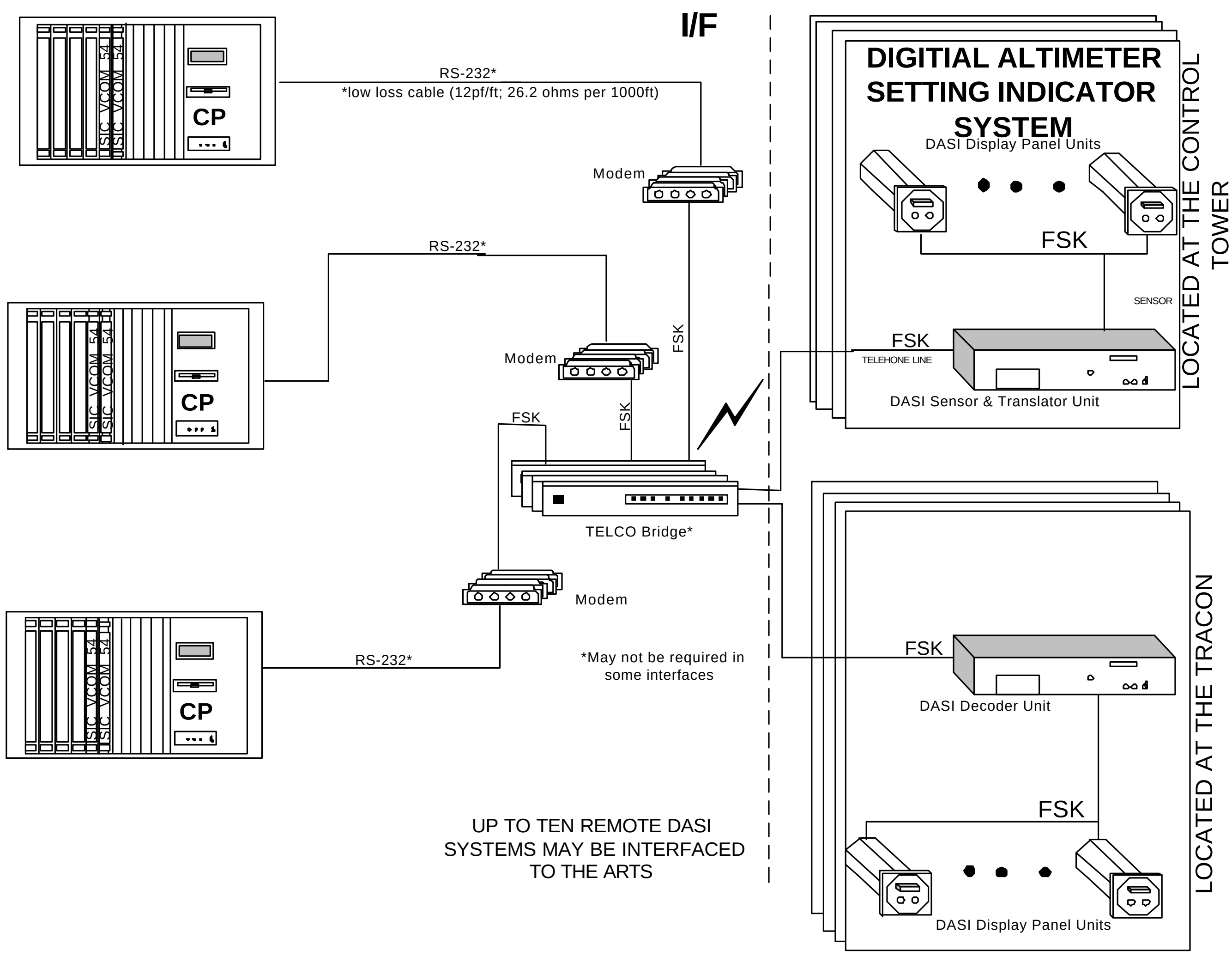


FIGURE 10-1. TYPICAL DASI TO ARTS SYSTEM INTERFACE

10.2 REFERENCED DOCUMENTS

10.2.1 Applicable Documents

The following documents shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

10.2.1.1 Applicable Government Documents

Specifications

None.

Standards

None.

Other Publications

TI-6560.62	Instruction Book Digital Altimeter Setting Indicator Contract No. DTFA01-92-Y-01048

10.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

EIA-RS-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Exchange
EIA-RS-422-A	Electrical Characteristics of Balanced Voltage Digital Interface Circuits, December 1978
EIA-RS-449	General Purpose 37-Position and 9-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange, January 1978 (Reaffirmed)
EIA-TIA-530-A	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Including Alternative 26-Position Connector, (ANSI/TIA-530-A-92), June 1992

Other Publications

None.

10.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052	ARTS IIIE Upgrade To Selected Air Traffic Control Facilities, Modification 8, 31 December 1993

FAA Specifications

FAA-E-2759 ARTS IIIE System Functional Specification, 13 August 1993

FAA Computer Program Functional Specification

None.

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

10.3 DIGITAL ALTIMETER SETTING INDICATOR INTERFACE DESCRIPTION

10.3.1 General Information

The DASI system is interfaced to the ARTS IIIE via a serial I/O channel from the CP to an FSK modem and TELCO bridge. The signal coming from the control tower (DASI Sensor and Translator Unit) is a two tone FSK analog signal over a telephone line (dedicated) to an FSK modem, and the output of the modem is an EIA RS-232 data link. There are two versions of the DASI system. The DASI TYPE FA-10454/1 (DASI SENSOR/TRANSLATOR) and TYPE FA-10454/2 (DASI DIGITAL DISPLAY PANEL) is the version that uses a 5 character format data word. The DASI TYPE FA-10035/1 (DASI SENSOR/TRANSLATOR), TYPE FA-10035/2 (DASI DIGITAL DISPLAY PANEL) and TYPE FA-10035/3 DASI DECODER is the version that uses a 8 character format data word. Site can have either or both types.

10.3.2 Mechanical Characteristics

The connections to the Decoder Unit and the Sensor and Translator Units at the TELCO Bridge are lug connections and are defined in Table 10-1.

TABLE 10-1. TELCO BRIDGE CONNECTIONS AT FSK DECODER

CONNECTOR	PIN	FUNCTION
3P3	A	FSK Input High
3P3	B	FSK Input Low

10.3.3 Electrical Characteristics

The FSK driver signal from the Sensor and Translator Unit provides two discrete frequencies.

10.3.3.1 Electrical Characteristics of the TYPE FA-10454 DASI

The FSK driver signal from the Sensor and Translator Unit provides two discrete frequencies. The two discrete frequencies are 980 hertz and 1180 hertz and the peak value is 0.35 volt. The characteristics impedance of the transmission line is 600 ohms. The nominal output level at the driver in the Sensor and Translator Unit is -9 dBm into the 600 ohm line, or approximately 0.275 volt RMS.

10.3.3.2 Electrical Characteristics TYPE FA-10035 DASI

The FSK driver signal from the Sensor and Translator Unit provides two discrete frequencies. The two discrete frequencies are 1070 hertz and 1270 hertz and the peak value is 0.35 volt. The characteristics impedance of the transmission line is 600 ohms. The nominal output level at the driver in the Sensor and Translator Unit is -9 dBm into the 600 ohm line, or approximately 0.275 volt RMS.

10.3.4 Protocol

The protocol for the two-tone FSK signal is illustrated in Figures 10-2A and 2B and 10-3A and 3B.

10.3.4.1 Protocol for the Type FA-10454 DASI

The protocol for the two-tone FSK signal is illustrated in Figures 10-2A and 10-3A. The interface conforms to the CCITT V.21 standard, operating at 110 baud. A Logic 0 is a SPACE with a frequency of 1180 hertz. A Logic 1 is a MARK and a frequency of 980 hertz. This result is a 200 hertz frequency shift between MARKs and SPACEs.

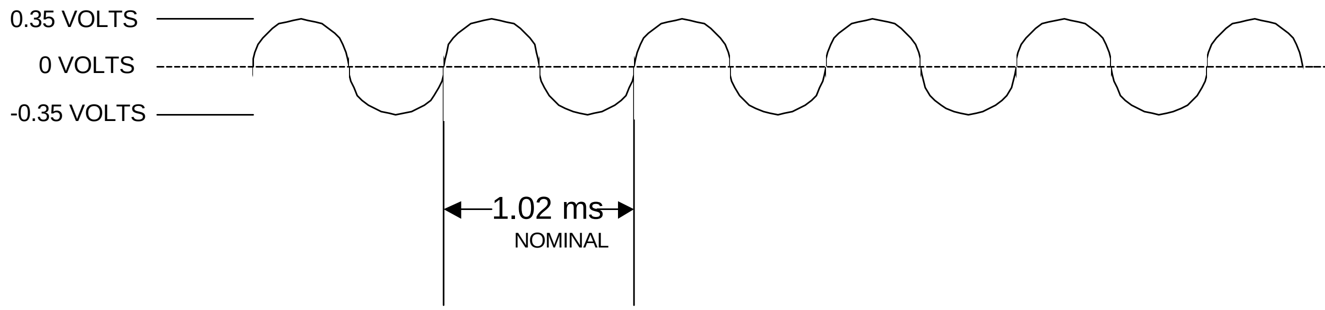


FIGURE 10-2A. FSK SIGNAL - NO ACTIVITY

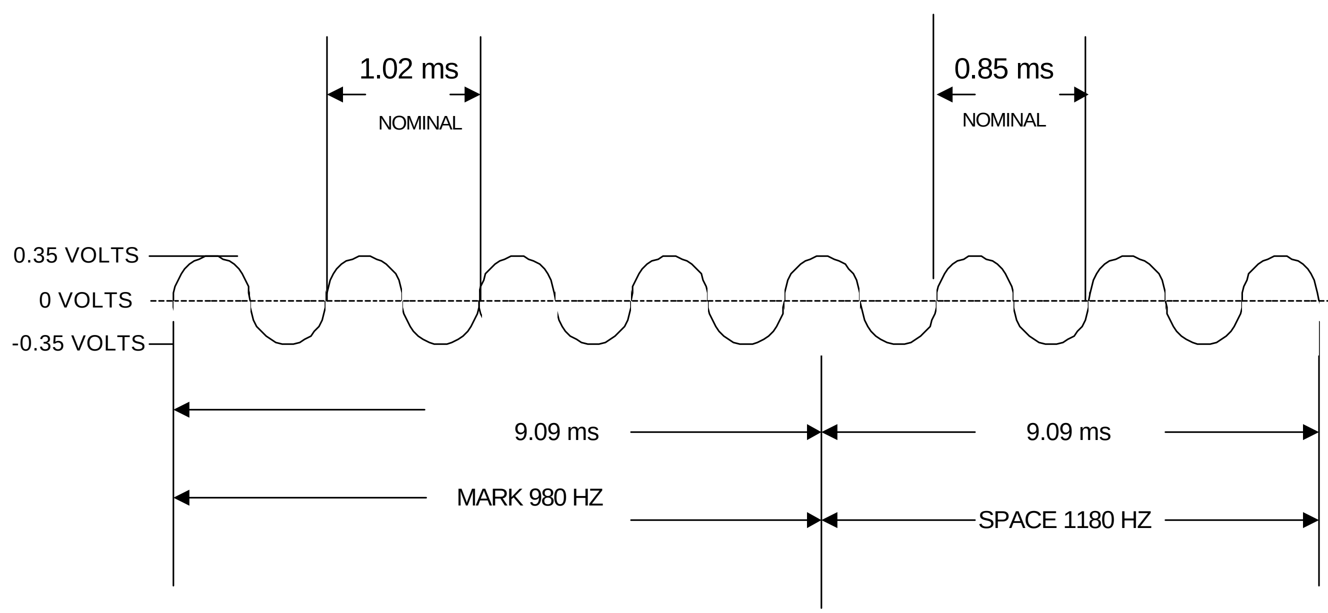


FIGURE 10-3A. FSK SIGNAL - DATA TRANSFER IN PROCESS

10.3.4.2 Protocol for the Type FA-10035 DASI

The protocol for the two-tone FSK signal is illustrated in Figures 10-2A and 10-3A. The interface is a standard, 300 baud. A Logic 0 is a SPACE with a frequency of 1070 hertz. A Logic 1 is a MARK and a frequency of 1270 hertz. This result is a 200 hertz frequency shift between MARKs and SPACEs.

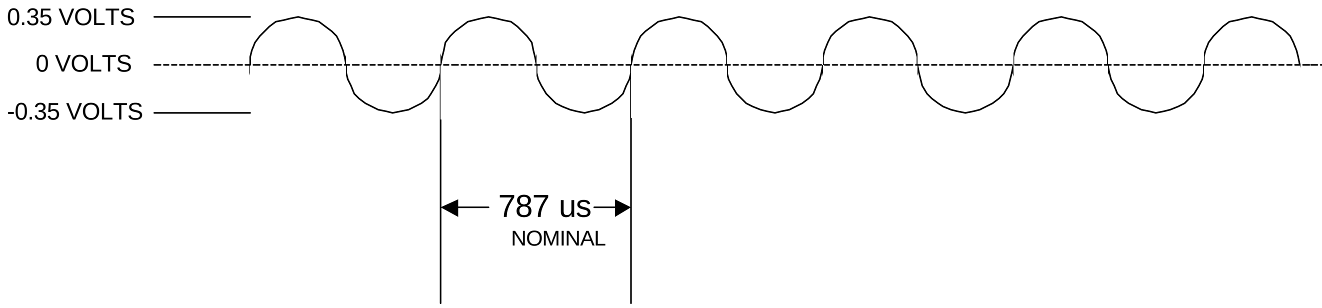


FIGURE 10-2B. FSK SIGNAL - NO ACTIVITY

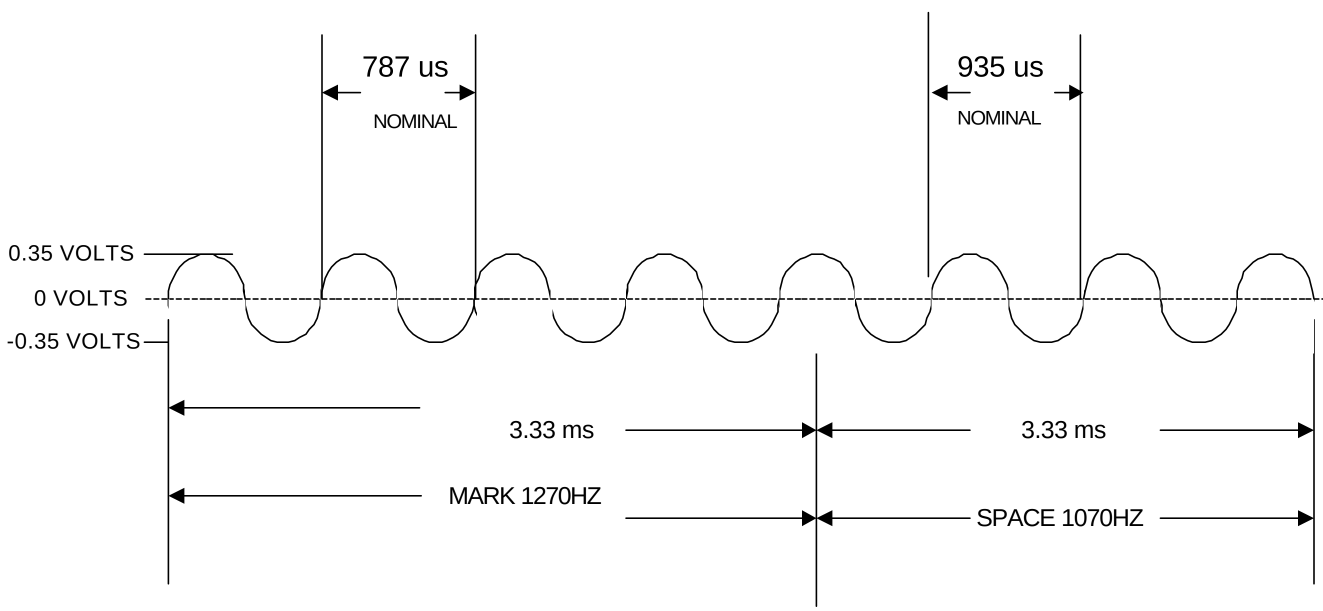


FIGURE 10-3B. FSK SIGNAL - DATA TRANSFER IN PROCESS

10.4 DATA FORMATS

There are two DASI data formats; one a five character and the second version an eight character. The exact type is defined as part of the site parameter data.

10.4.1 Data Formats Type FA-10454

The Type FA-10454 DASI altimeter data is received from each DASI interface once every 5 seconds, typically. The interface protocol and format of the data received are standard asynchronous ASCII. The first bit transferred is the LSB. Each message received from the DASI interface is a five character sequence of the following format.

Five Character DASI Type

Character	Description
First	10's digit of altimeter setting
Second	1's digit of altimeter setting
Third	decimal point
Fourth	tenth's digit of altimeter setting
Fifth	hundredth's digit of altimeter setting

Valid ASCII characters that can be received are:

Character	Hex Value	Meaning
0	30	zero
1	31	one
2	32	two
3	33	three
4	34	four
5	35	five
6	36	six
7	37	seven
8	38	eight
9	39	nine
E	3E	(error)

On power up, the DASI has a warm-up period, during which a null character is displayed as a left arrow. Once warmed up, the display reads normally. During error or test conditions the message may contain E characters in place of the digits normally in the message.

10.4.2 Data Formats Type FA-10035

The Type FA-10035 DASI altimeter data is received from each DASI interface once every 15 seconds, typically. The interface protocol and format of the data received are standard asynchronous ASCII. The first bit transferred is the LSB. Each message received from the DASI interface is a five character sequence of the following format.

Eight Character DASI Type

Character	Description
First	ASCII start of text character
Second	10's digit of altimeter setting
Third	1's digit of altimeter setting
Fourth	decimal point
Fifth	tenth's digit of altimeter setting
Sixth	hundredth's digit of altimeter setting
Seventh	thousand's digit of altimeter setting
Eighth	ASCII end of text character

Valid ASCII characters that can be received are:

Character	Hex Value	Meaning
STX	0x02	Start of Text
DP	0x2E	Decimal Point
ETX	0x33	End of Text
0	0x30	zero
1	0x31	one
2	0x32	two
3	0x33	three
4	0x34	four

5	0x35	five
6	0x36	six
7	0x37	seven
Character	Hex Value	Meaning
8	0x38	eight
9	0x39	nine
E	3E	(error)

On power up, the DASI has a warm-up period, during which the altimeter setting has an eight (8) ten's digit character.   Once warmed up, the display reads normally. During error or test conditions the message may contain E characters in place of the digits normally in the message

Section 11
ASR-9 RADAR SYSTEM INTERFACE

11.1 GENERAL DESCRIPTION

This external interface of the Common ARTS system with the ASR-9 radar is a serial interface for both the ARTS IIIE and ARTS IIE configurations. Each configuration is adapted based on the existing systems site hardware, but uses the Common ARTS software. The existing Surveillance and Communications Interface Processor (SCIP) interfaces have been by-passed for the ARTS IIIE configuration. The ASR-9 interface software is described in NAS-MD-636, Beacon/Radar Input Processing, and the details of the hardware are provided in TI 6310.31, Airport Surveillance Radar ASR-9 Technical Manual. Figure 11-1 illustrates the overall view of the ASR-9 to ARTS IIIE interface.

Figures 11-2 and 11-3 illustrate the overall view of the ASR-9 to the ARTS IIE system interface. This interface is via the SCIP, which is the same as the current ARTS IIA interface. The ASR-9 interface software is described in NAS-MD-636, Beacon/Radar Input Processing, and the hardware is described in TI 6310.31, Airport Surveillance Radar ASR-9 Technical Manual.

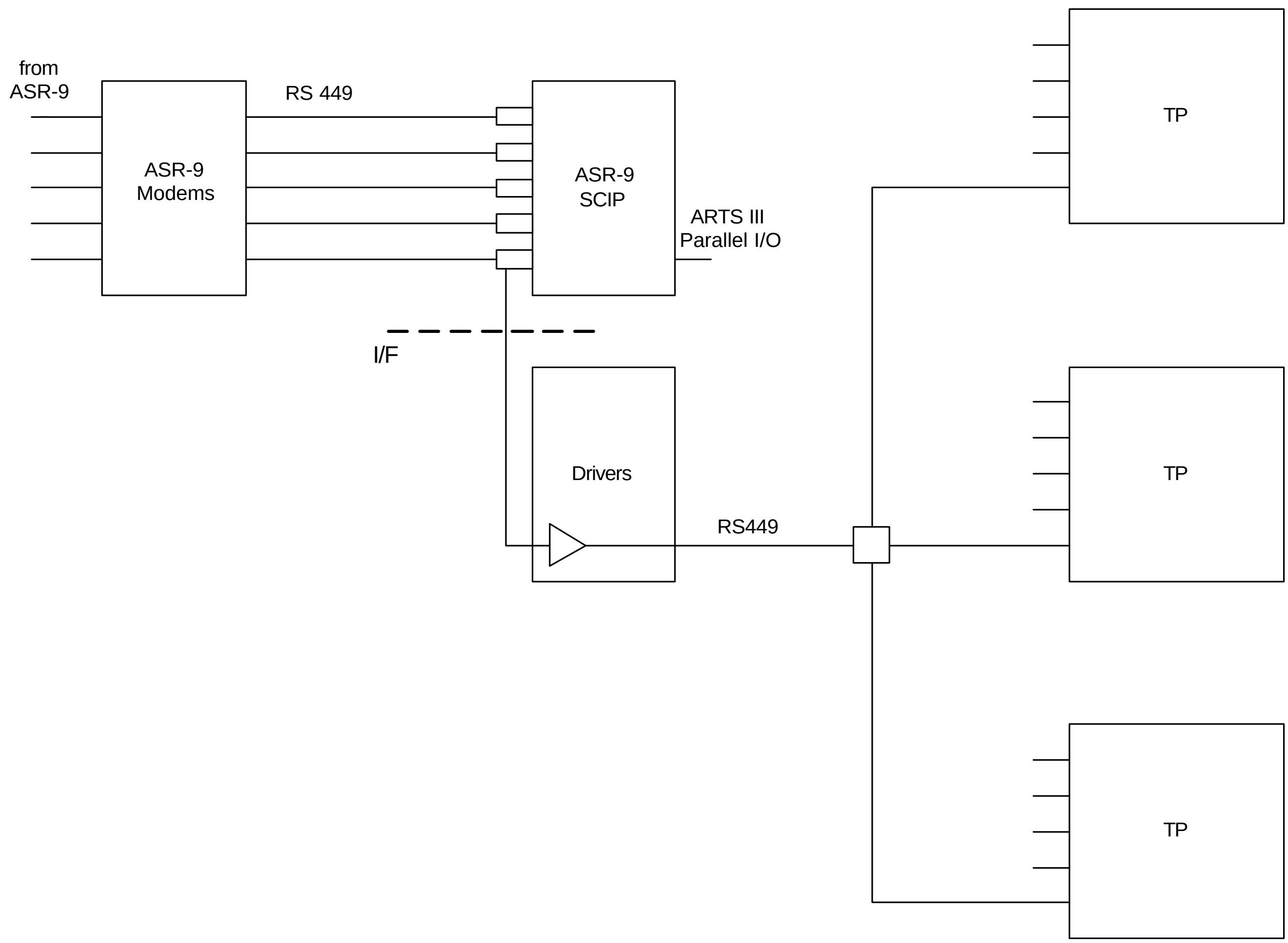


FIGURE 11-1. ASR-9 TO ARTS IIIE INTERFACE BLOCK DIAGRAM

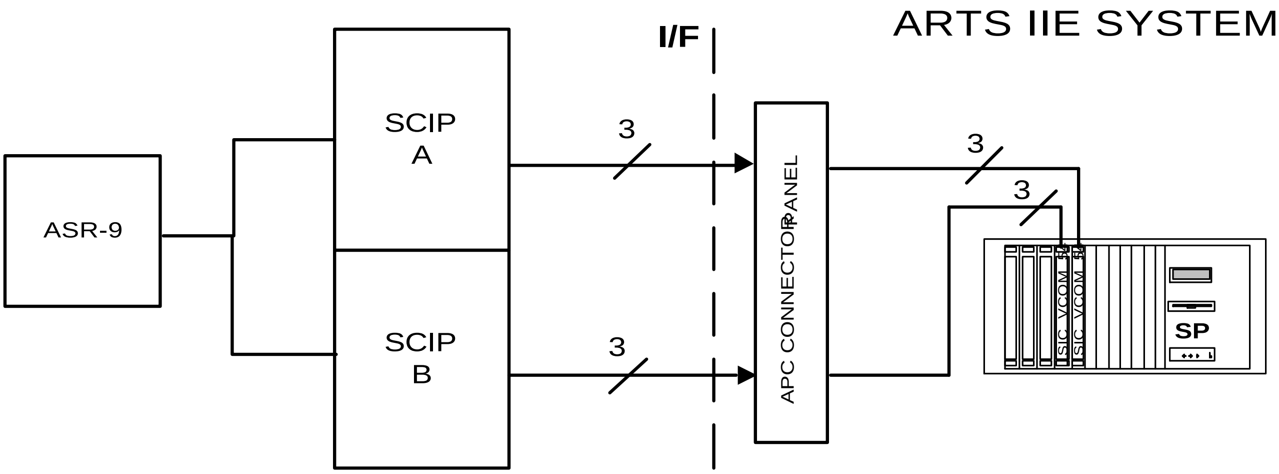


FIGURE 11-2. ASR-9 TO ARTS IIE INTERFACE BLOCK DIAGRAM

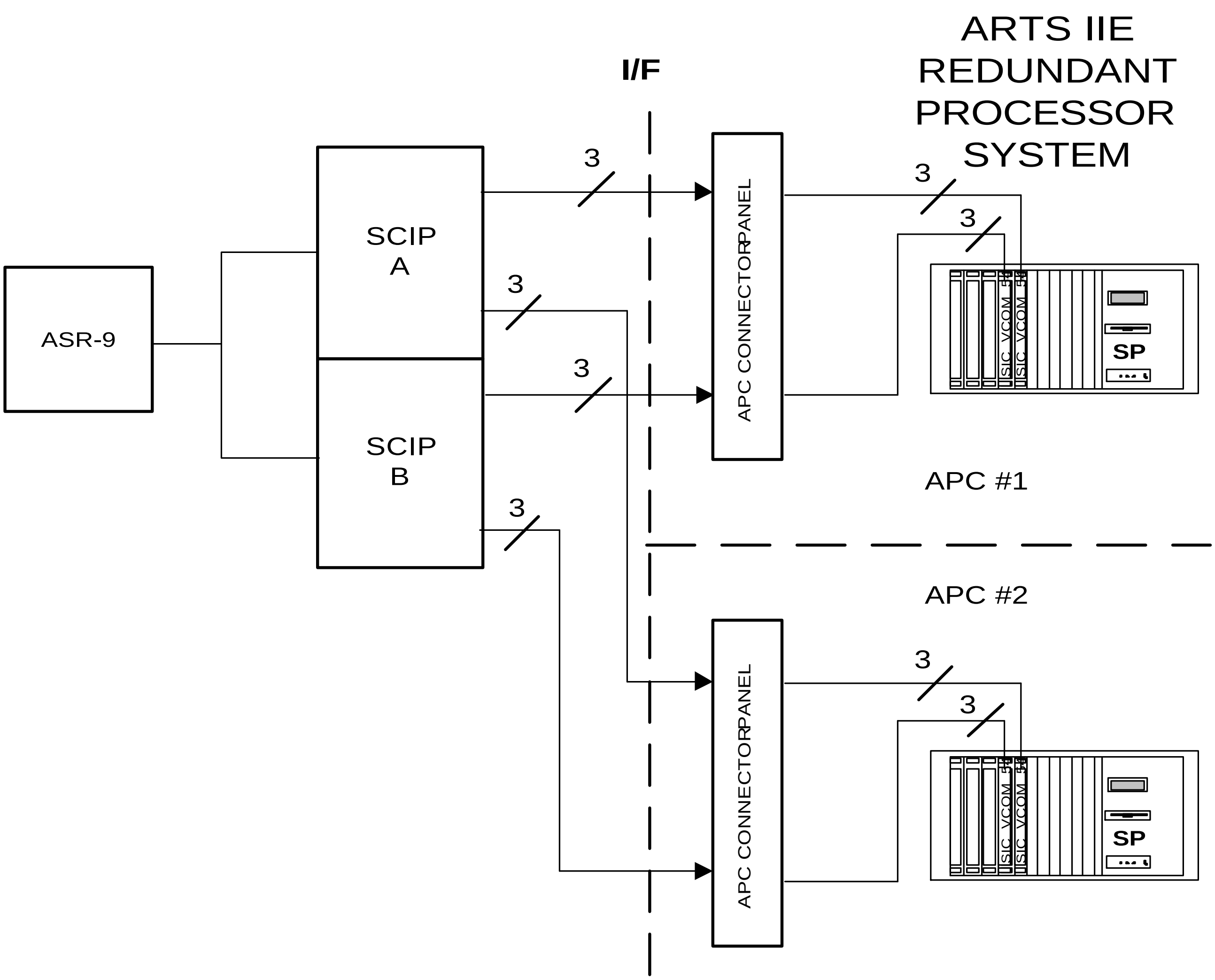


FIGURE 11-3. ASR-9 TO ARTS IIE (WITH REDUNDANT PROCESSORS) INTERFACE BLOCK DIAGRAM

11.2 REFERENCED DOCUMENTS

11.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

11.2.1.1 Applicable Government Documents

Specifications

None.

Standards

None.

Other Publications

None.

11.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

EIA-RS-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Exchange
EIA-RS-422-A	Electrical Characteristics of Balanced Voltage Digital Interface Circuits, December 1978
EIA-RS-449	General Purpose 37-Position and 9-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange, January 1978 (Reaffirmed)
EIA-TIA-530-A	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Including Alternative 26-Position Connector (ANSI/TIA-530-A-92), June 1992

Other Publications

TI 6310.31	Technical Manual for Airport Surveillance Radar System ASR-9, December 1990

11.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052	ARTS IIIE Upgrade To Selected Air Traffic Control Facilities, Modification 8, 31 December 1993
DTFA01-90-C-00057	ARTS IIA Interim Support Program for Air Traffic Control Facilities

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993
FAA-E-2570d	Automated Radar Terminal Air Traffic Control System ARTS IIA (draft)
FAA-E-2740A	Airport Surveillance Radar ASR-9, 07 August 1984
FAA-E-2217	AMENDMENT-4 2400 Bit-Per-Second Data Set Equipment Superseding Digital; Data

FAA Computer Program Functional Specifications

NAS-MD 636	Beacon/ Radar Input Processing, 15 November 1995

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

SE007-3	ASR-9 External Interface Control Document for the ASR-9 Sensor to Remote SCIP Interface for the ASR-9, Rev. G, 07 June 1989
SE007-4	ASR-9 External Interface Control Document for the ASR-9 SCIP to Terminal Computer, Rev. D, 02 October 1987

11.3 ARTS IIIE FROM ASR-9 INTERFACE DESCRIPTION

11.3.1 General Information

The ARTS IIIE from ASR-9 (Airport Surveillance Radar) interface is an industry standard serial interface. The RS-449 (electrical RS-422) at the modems of the ASR-9 radar system is the source for the radar data. There are three surveillance data channels (SURV-1, SURV-2, and SURV-3), one weather data channel (**SCWX-1**) and a spare serial channel that can be used for either a surveillance data channel or a weather data channel. The data at these channels is formatted by the ASR-9 radar system and the specific format for each type of data from the ASR-9 radar system is defined in detail in ASR-9 External Interface Control Document for the ASR-9 Sensor to Remote SCIP Interface for the ASR-9, (SE007-3), Rev. G, paragraph 5.5.

Each data channel is a synchronous serial data channel operating at 9600 bps.

11.3.2 Mechanical Characteristics

The mechanical implementation for the ARTS IIIE to ASR-9 interface includes an interface tap at the J3 connector on the back of the modem. A modem adapter connects the modem to both the SCIP cabinet and the RS-422 line drivers. The output of the line drivers is provided to each ARTS IIIE Track Processor. There is one modem adapter and one line driver for each of the five modem interfaces from the ASR-9. Figure 11-4 shows the ASR-9 adapter, and Figure 11-5 shows the application of the modem adapter. Tables 11-1 and 11-2 provide the functions and pinout for the J5 and J6 connectors that will be tapped to interface the ARTS IIIE system.

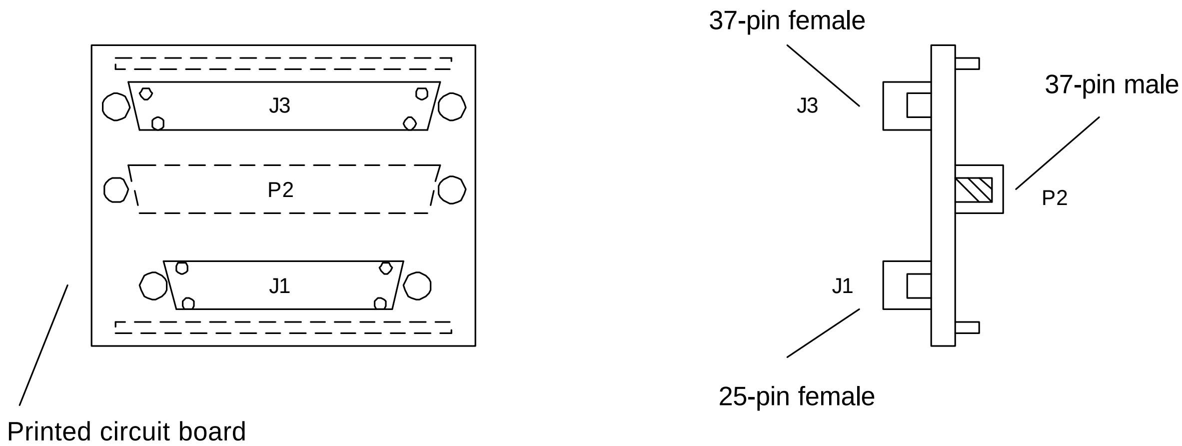


FIGURE 11-4. ASR-9 MODEM ADAPTER

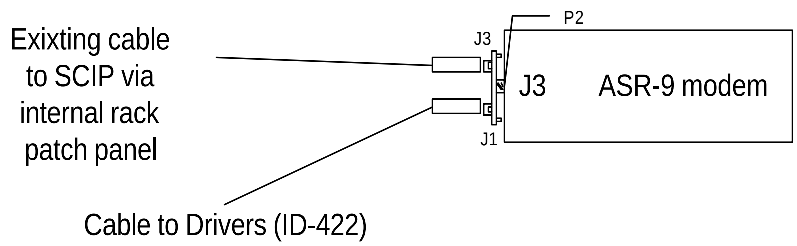


FIGURE 11-5. APPLICATION OF THE ASR-9 MODEM ADAPTERS

TABLE 11-1. MODEM CONNECTIONS USED FOR ARTS IIIE INTERFACE

INTERFACE CONNECTION	REMARKS
Surveillance Radar 1 Surveillance Radar 2 Surveillance Radar 3	Unit 21 Modem 1 Unit 21 Modem 2 Unit 21 Modem 4
Weather Radar 1 Spare	Unit 21 Modem 3 Unit 21 Modem 10

TABLE 11-2. MODEM TO LINE DRIVER CONNECTIONS

MODEM	CONNECTOR	PIN	SIGNAL	FUNCTION	CABLE	PIN	MODEM ADAPTER P3	PIN	LINE DRIVER (ID-422)
1	J3/P1	6	SURV1RD (±)	RECEIVE DATA	SURV-1	3	1	3	1
"	J3/P1	24	SURV1RD (±)	RECEIVE DATA	SURV-1	16	"	16	"
"	J3/P1	8	SURV1RD (±)	RECEIVE TIMING	SURV-1	17	"	17	"
"	J3/P1	26	SURV1RT (±)	RECEIVE TIMING	SURV-1	12	"	12	"
"	J3/P1	13	SURV1RT (±)	RECEIVE READY	SURV-1	8	"	8	"
"	J3/P1	31	SURV1RR (±)	RECEIVE READY	SURV-1	10	"	10	"
2	J3/P1	6	SURV1RR (±)	RECEIVE DATA	SURV-1	3	2	3	2
"	J3/P1	24	SURV2RD (±)	RECEIVE DATA	SURV-2	16	"	16	"
"	J3/P1	8	SURV2RD (±)	RECEIVE TIMING	SURV-2	17	"	17	"
"	J3/P1	26	SURV2RT (±)	RECEIVE TIMING	SURV-2	12	"	12	"
"	J3/P1	13	SURV2RT (±)	RECEIVE READY	SURV-2	8	"	8	"
"	J3/P1	31	SURV2RR (±)	RECEIVE READY	SURV-2	10	"	10	"
3	J3/P1	6	SURV2RR (±)	RECEIVE DATA	SURV-2	3	3	3	3
"	J3/P1	24	SURV3RD (±)	RECEIVE DATA	SURV-3	16	"	16	"
"	J3/P1	8	SURV3RD (±)	RECEIVE TIMING	SURV-3	17	"	17	"
"	J3/P1	26	SURV3RT (±)	RECEIVE TIMING	SURV-3	12	"	12	"
"	J3/P1	13	SURV3RT (±)	RECEIVE READY	SURV-3	8	"	8	"
"	J3/P1	31	SURV3RR (±)	RECEIVE READY	SURV-3	10	"	10	"
	J5	19	GROUND	GROUND		7		7	
4	J3/P1	6	SCWX1RD (±)	RECEIVE DATA	WX1C	3	4	3	4
"	J3/P1	24	SCWX1RD (±)	RECEIVE DATA	WX1C	16	"	16	"
"	J3/P1	8	SCWX1RT (±)	RECEIVE TIMING	WX1C	17	"	17	"
"	J3/P1	26	SCWX1RT (±)	RECEIVE TIMING	WX1C	12	"	12	"
"	J3/P1	13	SCWX1RR (±)	RECEIVE READY	WX1C	8	"	8	"
"	J3/P1	31	SCWX1RR (±)	RECEIVE READY	WX1C	10	"	10	"
10	J3/P1	6	SPARERD (±)	RECEIVE DATA	SPARE	3	10	3	10
"	J3/P1	24	SPARERD (±)	RECEIVE DATA	SPARE	16	"	16	"
"	J3/P1	8	SPARERT (±)	RECEIVE TIMING	SPARE	17	"	17	"
"	J3/P1	26	SPARERR (±)	RECEIVE TIMING	SPARE	12	"	12	"
"	J3/P1	13	SPARERR (±)	RECEIVE READY	SPARE	8	"	8	"
"	J3/P1	31	SPARERR (±)	RECEIVE READY	SPARE	10	"	10	"

11.3.3 Electrical Characteristics

The electrical characteristics of this interface are provided in ASR-9 External Interface Control Document for the ASR-9 Sensor to Remote SCIP Interface for the ASR-9, Rev. G, 07 June 1989, SE007-3, Section 5.1.2.

The signal levels for marking and spacing for the data and control to and from the converters and the serial I/O circuit card are specified in RS-422 Electrical Characteristics of Balanced Voltage Digital Interface Circuits.

11.3.4 Protocol

The meaningful RS-449 signals between the ASR-9 modems, line drivers, and track processors are as described in Table 11-3. The line driver is transparent to the protocol.

TABLE 11-3. RS 449 INTERFACE SIGNALS

SIGNAL	EIA-RS-449 IDENTIFIER	SOURCE
Receive Data	RD	ASR-9 Modem
Receive Timing	RT	ASR-9 Modem
Receiver Ready	RR	ASR-9 Modem

<u>Receive Data</u>

The data signals generated by the modem in response to data channel line signals received from a remote site are transferred on this circuit to the Track Processor.

<u>Receive Timing</u>

The modem signals on this circuit provide the Track Processor with receive signal element timing information. The transition from ON to OFF indicates the center of each Receive Data signal element. Timing information is provided whenever the modem is powered-on.

<u>Receiver Ready</u>

The Receiver Ready signal notifies the SCIP and TP that the modem is in a ready state.

11.3.5 Data Format

The data formats of the messages received from the ASR-9 modems on this interface are controlled by the ASR-9 External Interface Control Document for the ASR-9 Sensor to Remote SCIP Interface for the ASR-9, Rev. G, 07 June 1989, SE007-3, Section 5.5. The data provide in the following paragraphs is for information only.

Data generated at the ASR-9 site is passed unchanged through the modem system and is received at the input to the SCIP and Track Processors located at the ARTS site. The data stream is organized into word fields and messages. Thirteen (13) bits of data are defined as a word field and a message is a combination of word fields transmitted serially. The quantity of word fields in a message is dependent on the type of message and will be 49 7, 10 or 32 word fields. Each word field consists of 12 bits of data plus 1 bit of odd parity. The parity bit is the last bit transmitted in each word field. Word fields in messages are transmitted in order, in that word field 1 is first followed by word field 2, and so on.

Idle characters consisting of 3 binary 0's, followed by 10 binary 1's, are transmitted at least once between each message. In the absence of messages, idle characters are transmitted continuously.

The receiver looks for idle characters to establish word and message synchronization. Idle characters are even parity which distinguishes them from word fields.

The ASR-9 outputs 5 basic message types as follows:

- Surveillance
- Weather
- Sector Marks
- Status
- System Control Panel Communication

The Surveillance Messages are further divided into 7 different types as follows:

- Search Uncorrelated
- Search Correlated
- Search RTQC Uncorrelated
- Search RTQC Correlated
- Beacon Only
- Radar Beacon Merge
- Beacon RTQC

Sections 11.3.5.1 through 11.3.5.5 define in detail the bit format of each of the above messages.

The bit/binary states, i.e., “1” or “0”, that are used to define the states of each bit in a message are the states that exist on the RS-449 “send data” or “receive data” circuits.

11.3.5.1 Surveillance Messages

Surveillance is a general term defining a class of messages. The surveillance messages are those messages that contain position information associated with an aircraft or test targets. The ASR-9 outputs 7 types of surveillance messages as described in the following paragraphs.

11.3.5.1.1 Search Uncorrelated

Search uncorrelated messages are radar report messages from the primary ASR-9 radar which did not merge with a beacon message and have not been tracked by the ASR-9 surveillance processor. Included in these search uncorrelated messages will be radar reports from aircraft without transponders, radar reports from aircraft that failed to merge with its beacon report, radar reports from MTI reflectors, nonaircraft returns, and radar reports generated by false alarms. The format of the search uncorrelated message is defined in Table 11-4.

11.3.5.1.2 Search Correlated

Search correlated messages are generated by search uncorrelated reports that are tracked by the ASR-9 surveillance processor and successfully pass the ASR-9 track criteria. The format of the search correlated messages and the contents of the data within the message are identical to the search uncorrelated message prior to ASR-9 tracking, except that bit 12, word 4, will be set to a binary “1” indicating this message is correlated.

TABLE 11-4. SEARCH UNCORRELATED MESSAGE (52 BITS)

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING	
1	1	1	TEST	Active when the ASR-9 data is from an unavailable channel (not operational)	
	2	2	M	0	
	3	3	E	0	
	4	4	S	1	Search
	5	5	S	1	
	6	6	A	0	Message
	7	7	G	1	
	8	8	E	1	Label
	9	9		0	
	10	10	I	0	
	11	11	D	Set to Zero	
	12	12		Set to Zero	
	13	13	PAR	Parity “ODD”	
2	1	14		32 NM	
	2	15	R	16 NM	Range
	3	16		8 NM	
	4	17	A	4 NM	of the
	5	18		2 NM	
	6	19	N	1 NM	Radar
	7	20		1/2 NM	
	8	21	G	1/4 NM	Reports
	9	22		1/8 NM	
	10	23	E	1/16 NM	
	11	24		1/32 NM	
	12	25		1/64 NM	
	13	26	PAR	Parity “ODD”	
3	1	27		2048 ACPs	
	2	28		1024 ACPs	Azimuth of the
	3	29		512 ACPs	
	4	30	A	256 ACPs	
	5	31	Z	128 ACPs	
	6	32	I	64 ACPs	Radar Report
	7	33	M	32 ACPs	
	8	34	U	16 ACPs	
	9	35	T	8 ACPs	
	10	36	H	4 ACPs	
	11	37		2 ACPs	
	12	38		1 ACP	
	13	39	PAR	Parity “ODD”	

TABLE 11-4. SEARCH UNCORRELATED MESSAGE (52 BITS) (Continued)

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING
4	1	40	QUAL	00 = One CPI Report
	2	41	QUAL	01 = Two CPI Reports of Different Types (both PRFs)
				10 = Two or more CPI Reports, same PRF
				11 = Three or more CPI Reports, both PRFs
	3	42	CONF	000 Targets are in Road Traffic Map Areas
	4	43	CONF	001 Targets in Heavy Clutter. 010 = Interference
	5	44	CONF	011 Thermal, Angel False Targets and Aircraft <“R”
				101 Thermal, Angel False Targets and Aircraft >“R”
				100 Maximum Doppler from Zero Filter
	6	45	TRACK	TRACKING ELIGIBILITY
	7	46	TRACK	See ASR-9 to Remote SCIP ICD (SE007-3)
	8	47	QUAL	ARTS IIIA QUALITY
	9	48	QUAL	Determined from Target Confidence and Quality
	10	49	QUAL	Determined from Target Confidence and
	11	50	ZERO	Set to Zero
	12	51	CORRL	0 = Uncorrelated 1 = Correlated (Tracked)
	13	52	PAR	Parity “ODD”

11.3.5.1.3 Search RTQC Uncorrelated

The search RTQC (SRTQC) uncorrelated message is an ASR-9 internally generated test message injected (once per scan) to provide a measure of the quality of radar reports being received from the ASR-9. The SRTQC uncorrelated message contains information that describes the position, characteristics, and identification of the test target. The range and azimuth position of the SRTQC uncorrelated message are programmable anywhere within the radar instrument area from the ARTS RMS. The SRTQC uncorrelated message format is as follows in Table 11-5.

11.3.5.1.4 Search RTQC Correlated

The search RTQC correlated message is generated by the ASR-9 surveillance processor by taking the search RTQC uncorrelated message and giving it a movement in range. This message is then passed through the ASR-9 tracker. The surveillance processor then removes the range and azimuth displacement and outputs a correlated search RTQC with a range and azimuth identical to the uncorrelated search RTQC. The format of the search RTQC correlated message is identical to the uncorrelated SRTQC except bit 12 of word 4 will be set to a binary “1” indicating a correlated message.

TABLE 11-5. SEARCH RTQC UNCORRELATED MESSAGE (52 BITS)

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING	
1	1	1	M	1	This Message Label Field Identifies
	2	2	E	0	
	3	3	S	0	
	4	4	S	1	Search RTQC
	5	5	A	0	
	6	6	G	0	Message
	7	7	E	1	
	8	8		0	
	9	9	I	0	
	10	10	D	0	
	11	11	ZERO	Set to Zero	
	12	12	SECT	0=Search RTQC 1=Sector Mark Message	
	13	13	PAR	Parity "ODD"	
2	1	14		32 NM	
	2	15	R	16 NM	Range
	3	16		8 NM	
	4	17	A	4 NM	of the
	5	18		2 NM	
	6	19	N	1 NM	Search RTQC
	7	20		1/2 NM	
	8	21	G	1/4 NM	Report
	9	22		1/8 NM	
	10	23	E	1/16 NM	
	11	24		1/32 NM	
	12	25		1/64 NM	
	13	26	PAR	Parity "ODD"	
3	1	27		2048 ACPs	
	2	28		1024 ACPs	Azimuth of the
	3	29		512 ACPs	
	4	30	A	256 ACPs	Search RTQC
	5	31	Z	128 ACPs	
	6	32	I	64 ACPs	
	7	33	M	32 ACPs	
	8	34	U	16 ACPs	
	9	35	T	8 ACPs	
	10	36	H	4 ACPs	
	11	37		2 ACPs	
	12	38		1 ACP	
	13	39	PAR	Parity "ODD"	

TABLE 11-5. SEARCH RTQC UNCORRELATED MESSAGE (52 BITS) (Continued)

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING
4	1	40	QUAL	00 = One CPI Report
	2	41	QUAL	01 = Two CPI Reports of Different Types (both PRFs)
				10 = Two or more CPI Reports, same PRF
				11 = Three or more CPI Reports, both PRFs
	3	42	CONF	000 Targets are in Road Traffic Map Areas
	4	43	CONF	001 Targets in Heavy Clutter. 010 = Interference
	5	44	CONF	011 Thermal, Angel False Targets and Aircraft <"R"
				101 Thermal, Angel False Targets and Aircraft >"R"
				100 Maximum Doppler from Zero Filter
	6	45	TRACK	TRACKING ELIGIBILITY
	7	46	TRACK	See ASR-9 to Remote SCIP ICD (SE007-3)
	8	47	QUAL	ARTS IIIA QUALITY
	9	48	QUAL	Determined from Target Confidence and Quality
	10	49	QUAL	Determined from Target Confidence and Quality
	11	50	ZERO	Set to Zero
	12	51	CORRL	0 = Uncorrelated 1 = Correlated (Tracked)
	13	52	PAR	Parity "ODD"

11.3.5.1.5 Beacon Only Message

Beacon messages contain information from a beacon equipped aircraft. The information consist of 3/A code, 2 code, altitude information and special identifiers. Position information, determined by the ASR-9 beacon target detector and ASR-9 beacon target detector and ASR-9 beacon reply processor, is also included in the message.

Beacon only messages are beacon messages that do not have a search message to merge with. The format of the beacon only message is defined in Table 11-6.

TABLE 11-6. BEACON ONLY MESSAGE

FIELD	FLD BIT	MSG BIT	ID	ASR-9 MEANING
1	1		BCN	0 = Beacon Target Report 1 = Beacon RTQC
	2	2	ID	1 Beacon Message Identifier
	3	3	ID	1 Beacon Message Identifier
	4	4	M2VAL	1 = Meets Mode 2 Validation Threshold of ASR-9 0 = Does Not meet Mode 2 Validation Threshold of ASR-9
	5	5	M3VAL	Mode 3/A Validation
	6	6	M3VAL	Mode 3/A Validation
	7	7	IDENT	1 = Validated Ident response Mode 3 or 2
	8	8	R/R	Search Reinforced. 1 = Search Merged w/Beacon
	9	9	EMER	1= 7700 Civil or Military Emergency
	10	10	EMER	1= 7600 Civil or Military Radio Failure
	11	11	3XVAL	1 = Validated Mode 3 "X" Response
	12	12	0	Set to Zero
	13	13	PAR	Parity "ODD"

TABLE 11-6. BEACON ONLY MESSAGE (Continued)

FIELD	FLD BIT	MSG BIT	ID	ASR-9 MEANING
2	1	14		32 NM
	2	15	R	16 NM Range
	3	16		8 NM
	4	17	A	4 NM of the
	5	18		2 NM
	6	19	N	1 NM
	7	20		1/2 NM
	8	21	G	1/4 NM
	9	22		1/8 NM
	10	23	E	1/16 NM Beacon Report
	11	24		1/32 NM
	12	25		1/64 NM
	13	26	PAR	Parity "ODD"
3	1	27		2048 ACPs
	2	28		1024 ACPs Azimuth
	3	29		512 ACPs
	4	30	A	256 ACPs of the
	5	31	Z	128 ACPs
	6	32	I	64 ACPs Beacon Report
	7	33	M	32 ACPs
	8	34	U	16 ACPs
	9	35	T	8 ACPs
	10	36	H	4 ACPs
	11	37		2 ACPs
	12	38		1 ACP
	13	39	PAR	Parity "ODD"
4	1	40	QUAL	4 ACPs > SRB ARTS IIIA Quality (Beacon)
	2	41	QUAL	2 ACPs > SRB Beacon Run Length Above Threshold
	3	42	QUAL	1 ACP > SRB (SBR) Counts Greater than 7=7
	4	43	DSCRE	1 = Discrete Mode 3/A Code Info in C and D fields
	5	44	2XVAL	1 = Validated Mode 2 "X" Responses.
	6	45	BNC Hit Cnt	16 BCN Hits
	7	46	BNC Hit Cnt	8 BCN Hits Number of Beacon Replies
	8	47	BNC Hit Cnt	4 BCN Hits That Created the
	9	48	BNC Hit Cnt	2 BCN Hits Beacon Report
	10	49	BNC Hit Cnt	1 BCN Hits
	11	50	MCVAL	Mode C Validation
	12	51	MCVAL	Mode C Validation
	13	52	PAR	Parity "ODD"

TABLE 11-6. BEACON ONLY MESSAGE (Continued)

FIELD	FLD BIT	MSG BIT	ID	ASR-9 MEANING
5	1	53	A4	
	2	54	A2	MODE 3/A Code (OCTAL)
	3	55	A1	
	4	56	B4	
	5	57	B2	
	6	58	B1	
	7	59	C4	Uniquely identifies the Beacon Target
	8	60	C2	
	9	61	C1	
	10	62	D4	
	11	63	D2	
	12	64	D1	
	13	65	PAR	Parity
6	1	66	D4	
	2	67	C1	MODE 2 Code (OCTAL)
	3	68	A1	
	4	69	C2	
	5	70	A2	
	6	71	C4	
	7	72	A4	Uniquely identifies the Beacon Target
	8	73	B1	
	9	74	D1	
	10	75	B2	
	11	76	D2	
	12	77	B4	
	13	78	PAR	Parity "ODD"
7	1	79	SIGN	1 = Negative Altitude and 2's Complement Form
	2	80	ALTITUDES 100s FEET	102,400 feet
	3	81	ALTITUDES 100s FEET	51,200 feet
	4	82	ALTITUDES 100s FEET	25,600 feet
	5	83	ALTITUDES 100s FEET	12,800 feet MODE C Altitude
	6	84	ALTITUDES 100s FEET	6,400 feet
	7	85	ALTITUDES 100s FEET	3,200 feet
	8	86	ALTITUDES 100s FEET	1,600 feet
	9	87	ALTITUDES 100s FEET	800 feet Identifies the Altitude
	10	88	ALTITUDES 100s FEET	400 feet of the Target Report
	11	89	ALTITUDES 100s FEET	200 feet
	12	90	ALTITUDES 100s FEET	100 feet
	13	91	PAR	Parity "ODD"

11.3.5.1.6 Radar Beacon Merge Message

The radar beacon merge message is created when an uncorrelated search report and a beacon only report are determined to be within a certain range/azimuth spacing of each other. The range/azimuth spacing is the merge window and is programmable from the RMS. The adjustable size of the window is from 0 to 128 ACPs in 1 ACP increments and from 0 to 2 NM in 1/64 NM. The nominal setting is 32 ACP by 10164 NM. The reported range and azimuth of the merge message may be from the search report or the beacon report. Table 11-7 shows the range and azimuth reporting possibilities for a radar beacon merge message. This selection is programmed from the RMS.

TABLE 11-7. MERGE MESSAGE POSITION REPORTING SELECTION

RANGE	AZIMUTH
BEACON	BEACON
RADAR	RADAR
BEACON	RADAR
RADAR	BEACON

The format of the radar beacon merge message is the same as a beacon only message except that bit B, word 1, is set to a binary "1" indicating a merged message.

11.3.5.1.7 Beacon RTQC Message

The Beacon RTQC (BRTQC) is a test target generated internally in the ASR-9 beacon target detector. This message is used to indicate the quality of the beacon data processed by the ASR-9. The format of the BRTQC is the same as the beacon only message or, if merged with an SRTQC, will be the same as the radar beacon merged message with the exception of bit 1, word 1, which will be set to a "1" indicating a BRTQC.

11.3.5.2 Weather Message

The weather message is used to report the presence of weather, as detected by radar reflectivity, within an azimuth sector. The azimuth sector is 16 ACPs wide, therefore, it requires 256 weather messages to report a full (360°) weather map. Between each weather message is at least one idle pattern, as defined in paragraph 11.3.5, and if a system Control Panel Communications (CPC) message is setting in the queue, it will be inserted in between the weather messages. Weather maps are reported starting with azimuth sector 2 and ending with azimuth sector 1 as shown below:

TABLE 11-7a. Order of Weather Message Reporting

MESSAGES	AZIMUTH SECTOR	FIELD 2 1	2	3	4	5	6	7	8	AZIMUTH AREA BEING REPORTED
FIRST MESSAGE	2	0	0	0	0	0	0	1	0	32 TO 48 ACPs
	3	0	0	0	0	0	0	1	1	48 TO 64 ACPs
	4	0	0	0	0	0	1	0	0	64 TO 80 ACPs
	●					●				●
	●					●				●
	●					●				●
	●					●				●
	●					●				●
	●					●				●

	255	1	1	1	1	1	1	1	1	4080 TO 0 ACPs
	0	0	0	0	0	0	0	0	0	0 TO 16 ACPs
LAST MESSAGE	1	0	0	0	0	0	0	0	1	16 TO 32 ACPs

Up to 9 scans are required to generate a full weather map, send it to the SCIP and have the SCIP reconstitute the map into two analog levels for display on the ARTS displays. Maps are updated to the ARTS display by the SCIP every 6 scans.

A weather message consists of 32 thirteen bit fields as shown in Table 11-8. A brief discussion of the contents of each field is provided below.

Field 1

- Contains the weather message label that uniquely identifies this message as a weather message.

- Contains a bit which defines which weather processor generated the weather message.

- Contains 3 bits which report the threshold level used to define areas of lower level weather. Only used for 2 level weather.

Field 2

- Contains a B bit azimuth field that reports the start azimuth for the 16 ACP azimuth sector being reported by this message.

- Contains 3 bits which report the threshold level used to define areas of high level weather. Only used for 2 level weather.

Field 3-32

- Each field contains 12 bits that define the level of weather contained within a two nautical mile area in 1/2 NM increments.

TABLE 11-8. WEATHER MESSAGE

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING
1	1	1	Test	Active when the ASR-(Weather data is from an unavailable Post Processor (not Operational)
	2	2		0
	3	3	I	1
	4	4	D	0 WEATHER
	5	5		0 MESSAGE
	6	6	SOURCE	0=2 Level Wx 1= 6 Level Wx LABEL
	7	7	SPARE	
	8	8	SPARE	
	9	9	SPARE	
	10	10	THRSH	
	11	11	THRSH	001-11-=Low Level Threshold Value
	12	12	THRSH	
	13	13	PAR	Parity "ODD"
2	1	14		2048 ACPs-180 degrees
	2	15	W A	1024 ACPs--90 degrees
	3	16	E Z	512 ACPs---45
	4	17	A I	256 ACPs---22.5
	5	18	T M	128 ACPs---11.25
	6	19	H U	64 ACPs------5.625
	7	20	E T	32 ACPs------2.813
	8	21	R H	16 ACPs------1.406
	9	22	SPARE	1/8 NM
	10	23	THRSH	
	11	24	THRSH	001-11-=Low Level Threshold Value
	12	25	THRSH	
	13	26	PAR	Parity "ODD"
3	1	27		MSB
	2	28	LEVEL	1/2 NM
	3	29		LSB
	4	30		MSB Level of Wx
	5	31	LEVEL	1 NM Reported for
	6	32		LSB Each Range Cell
	7	33		MSB from 1/2 NM to 2 NM
	8	34	LEVEL	1 1/2 NM
	9	35		LSB
	10	36		MSB
	11	37	LEVEL	2 NM
	12	38		LSB
	13	39	PAR	Parity "ODD"

TABLE 11-8. WEATHER MESSAGE (Continued)

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING		
4	1	40		MSB		
	2	41	LEVEL		2 1/2 NM	
	3	42		LSB		
	4	43		MSB		Level of Wx
	5	44	LEVEL		3 NM	Reported for
	6	45		LSB		Each Range Cell
	7	46		MSB		from 2-1/2 NM to 4 NM
	8	47	LEVEL		3 1/2 NM	
	9	48		LSB		
	10	49		MSB		
	11	50	LEVEL		4 NM	
	12	51		LSB		
	13	52	PAR	Parity "ODD"		
FIELDS	5	THRU	31	CONTAIN WEATHER CELLS FROM 4 Nautical Miles to 58 Nautical Miles		
32	1	404		MSB		
	2	405	LEVEL		58 1/2 NM	
	3	406		LSB		
	4	407		MSB		Level of Wx
	5	408	LEVEL		59 NM	Reported for
	6	409		LSB		Each Range Cell
	7	410		MSB		from 58 1/2 NM to
	8	411	LEVEL		59 1/2 NM	60 NM
	9	412		LSB		
	10	413		MSB		
	11	414	LEVEL		60 NM	
	12	415		LSB		
	13	416	PAR	Parity "ODD"		

11.3.5.3 Sector Mark Message

The sector mark message may be selected from the ASR-9 RMS as either a search formatted message or a Beacon RTQC formatted message. Normal operation ASR-9, when feeding an SCIP, is to use the search RTQC formatted message. Firmware changes will be required to the SCIP if the Beacon RTQC formatted message is selected.

The selected message is synchronous with the ASR-9 antenna and is generated every 11.25° for a total of 32 messages per scan. The azimuth reported in field 3 of the message represents the azimuth of the ASR-9 antenna as the message is transmitted to the modem at the ASR-9 site. The format of search sector mark message is shown in Table 11-9. The format of the Beacon Sector Mark message is defined in paragraph 11.3.5.3.1.

TABLE 11-9. SEARCH SECTOR MARK MESSAGE

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING	
1	1	1	M	1	
	2	2	E	0	
	3	3	S	0	
	4	4	S	1	Search Sector
	5	5	A	0	
	6	6	G	0	Mark Message
	7	7	E	1	
	8	8		0	
	9	9	I	0	
	10	10	D	0	
	11	11		Set to Zero	
	12	12	0/1	0=search RTQC 1=Sector Mark Message	
	13	13	PAR	Parity "ODD"	
2	1	14	0		
	2	15	0		
	3	16	0		
	4	17	0		
	5	18	0		
	6	19	0		
	7	20	0		
	8	21	0		
	9	22	0		
	10	23	0		
	11	24	0		
	12	25	0		
	13	26	PAR	Parity "ODD"	
3	1	27		2048 ACPs	
	2	28		1024 ACPs	Azimuth of the
	3	29		512 ACPs	
	4	30	A	256 ACPs	Sector Mark
	5	31	Z	128 ACPs	
	6	32	I	64 ACPs	
	7	33	M	32 ACPs	
	8	34	U	16 ACPs	
	9	35	T	8 ACPs	
	10	36	H	4 ACPs	
	11	37		2 ACPs	
	12	38		1 ACP	
	13	39	PAR	Parity "ODD"	
4	1	40	0		
	2	41	0		
	3	42	0		
	4	43	0		
	5	44	0		
	6	45	0		
	7	46	0		
	8	47	0		
	9	48	0		
	10	49	0		
	11	50	0		
	12	51	0		
	13	52	PAR	Parity "ODD"	

11.3.5.3.1 Beacon Sector Mark Message

If selected by the ASR-9 RMS, a Beacon RTQC formatted Sector Mark message may be output from the ASR-9 sensor instead of the normal search sector mark message.

To distinguish a beacon sector mark message from a Beacon RTQC message, bit l2 of field 1 in the sector mark message shall be set to a “1”. Bits 1, 2 and 3 of field 1 shall also be set to a “1”. All other bits in the fields, except for the azimuth field and parity, shall be set to a “0”.

The azimuth reported in field 3 represents the azimuth of the ASR-9 antenna at the time the message is transmitted to the modem at the ASR-9 site.

11.3.5.4 Status Message

The Status message provides information from the ASR-9 as to the system configuration and any summary fault type alarms. This message is sent from the ASR-9 to the SCIP every 4.8 seconds and whenever a change in status occurs The format of the status message is shown in Table 11-10.

TABLE 11-10. SYSTEM STATUS MESSAGE

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING	
1	1	1	Test	Active when the ASR-9 is from an Unavailable Post Processor (not operational)	
	2	2	M	0	
	3	3	SE	0	
	4	4	S	0	Status
	5	5	S	1	
	6	6	A	1	Message
	7	7	G	0	
	8	8	E	0	Label
	9	9		0	
	10	10	I D	0	
	11	11	0	Set to Zero	
	12	12	0	Set to Zero	
	13	13	PAR	Parity “ODD”	
2	1	14	S	Channel On-Line (1=Channel A)	
	2	15	T	Channel A alarm (1= Alarm)	
	3	16	A	Channel A Unavailable (1= Unavailable)	
	4	17	T	Channel B alarm (1= Alarm)	
	5	18	U	Channel B Unavailable (1= Unavailable)	
	6	19	S	Post Processor On-Line (1 = Channel A)	
	7	20		Post Processor A (1= Alarm)	
	8	21	A	Post Processor A Unavailable (1= Unavailable)	
	9	22	L	Post Processor B (1= Alarm)	
	10	23	A	Post Processor B Unavailable (1= Unavailable)	
	11	24	R	Wx Processor On-Line (1 = 6 Level On-Line)	
	12	25	M	Wx Channel Alarm (1 = Alarm)	
	13	26	S	Parity “ODD”	

TABLE 11-10. SYSTEM STATUS MESSAGE (Continued)

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING
3	1	27	S	High Voltage (1 = HV ON)
	2	28	T	Antenna Polarization 0 = LP, 1 = CP
	3	29	A	Antenna Rotation (1 = Antenna Rotating)
	4	30	T	SCIP On-Line; 1 = SCIP A; 0 = SCIP B (IND.SCIP)
	5	31	U	SCIP Channel A Alarm (1 = Alarm)
	6	32	S	SCIP Channel B Alarm (1 = Alarm)
	7	33		Maintenance Alarms (1 = Alarm)
	8	34	A	COMM Link A Alarms (1 = Alarm)
	9	35	L	COMM Link B Alarms (1 = Alarm)
	10	36	A	RMS Alarm
	11	37	R	Spare
	12	38	M	Spare
	13	39	S	Parity “ODD”
4	1	40	S	Beacon Channel (ATCBI/Mode S) On-Line (1 = Channel A)
	2	41	T	Beacon Channel (ATCBI/Mode S) A Alarm
	3	42	A	Beacon Channel (ATCBI/Mode S) B Alarm
	4	43	T	Reserved for Mode S
	5	44	U	Reserved for Mode S To
	6	45	S	Reserved for Mode S
	7	46		Reserved for Mode S Be
	8	47	A	Reserved for Mode S
	9	48	L	Reserved for Mode S Updated
	10	49	A	Reserved for Mode S
	11	50	R	Reserved for Mode S When Available
	12	51	M	Reserved for Mode S
	13	52	S	Parity “ODD”

11.3.5.5 System Control Panel Communications (CPC) from the ASR-9 Sensor to the ARTS Site

The system CPC is the only duplex, two-way message traffic that exists between the ASR-9 sensor and the ARTS site. This section defines only the format of the CPC messages that exist from the ASR-9 site to the ARTS site. The ARTS Track Processors will be in a receive-only mode for this interface; they will not transmit data back to the ASR-9 radar system.

The CPC message provides communication between the system control at the ASR-9 sensor and the ASR-9 remote system control at the ARTS site. CPC messages are generated for the following reasons:

1. Once per scan from the ASR-9 system control to the ARTS site, to ensure the system communication path is working and to ensure the remote SCIP’s system control memory contains the same information as the local ASR-9 system control memory.
2. Whenever the local ASR-9 and remote SCIP system control panel in control, or ASR-9 RMS in control, initiates a system control panel switch action.
3. Whenever a change occurs in the fault status of the ASR-9 system or configuration of the ASR-9 system that requires a status indicator update on the system control panels.

CPC messages are always echoed back to the originating end by the SCIP. This echo provides feedback to the originating end that the communication channel is working and that the receiver end has received the message.

CPC messages are sent in identical pairs. The receiving end must receive an identical pair before performing any actions.

Table 11-11 shows the format for the CPC message. Unless specified in the formats a binary I will define the existence or occurrence of the condition defined in each CPC bit location.

TABLE 11-11. SYSTEM CONTROL PANEL COMMUNICATIONS

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING	
1	1	1	Test	Active when the ASR-9 is from an Unavailable Post Processor (not operational)	
	2	2	M	0	
	3	3	SE	0	
	4	4	S	1	CPC
	5	5	S	0	
	6	6	A	1	Message
	7	7	G	0	
	8	8	E	0	Label
	9	9		0	
	10	10	I D	0	
	11	11	0	Set to Zero	
	12	12	0	Set to Zero	
	13	13	PAR	Parity “ODD”	
2	1	14	S	Channel On-Line (1=Channel B)	
	2	15	T	Channel A Alarm	
	3	16	A	Channel A Unavailable	
	4	17	T	Channel B Alarm	
	5	18	U	Channel B Unavailable	
	6	19	S	Post Processor On-Line (1 = Channel A)	
	7	20		Post Processor A Alarm	
	8	21	A	Post Processor A Unavailable	
	9	22	L	Post Processor B Alarm	
	10	23	A	Post Processor B Unavailable	
	11	24	R	Wx Processor On-Line (1 = 2 Level On-Line)	
	12	25	M	Wx Channel Alarm	
	13	26	S	Parity “ODD”	
3	1	27	S	High Voltage (1 = HV ON)	
	2	28	T	Antenna Polarization 0 = LP, 1 = CP	
	3	29	A	Antenna Rotation (1 = Antenna Rotating)	
	4	30	T	SCIP On-Line; 1 = SCIP A; 0 = SCIP B (IND.SCIP)	
	5	31	U	SCIP Channel A Alarm	
	6	32	S	SCIP Channel B Alarm	
	7	33		Maintenance Alarms)	
	8	34	A	COMM Link A Alarms	
	9	35	L	COMM Link B Alarms	
	10	36	A	RMS Alarm	
	11	37	R	Spare	
	12	38	M	Spare	
	13	39	S	Parity “ODD”	

TABLE 11-11. SYSTEM CONTROL PANEL COMMUNICATIONS (Continued)

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING
4	1	40	S	Beacon Channel (ATCBI/Mode S) On-Line (1 = Channel A)
	2	41	T	Beacon Channel (ATCBI/Mode S) A Alarm
	3	42	A	Beacon Channel (ATCBI/Mode S) B Alarm
	4	43	T	Reserved for Mode S
	5	44	U	Reserved for Mode S
	6	45	S	Reserved for Mode S
	7	46		Reserved for Mode S
	8	47	A	Reserved for Mode S
	9	48	L	Reserved for Mode S
	10	49	A	Reserved for Mode S
	11	50	R	Reserved for Mode S
	12	51	M	Reserved for Mode S
	13	52	S	Parity “ODD”
5	1	53	C	Channel in Transition
	2	54	O	Post Processor in Transition
	3	55	N	Polarization in Transition
	4	56	T	SCIP in Transition
	5	57	R	Take Control
	6	58	O	Release Control
	7	59	L	Channel A Standby
	8	60	&	Channel B Standby
	9	61	A	Mode S Alarm
	10	62	L	ATCBI Alarm
	11	63	R	Change on-line SCIP A/B or B/A
	12	64	M	ASR-9 Alarm
	13	65	PAR	Parity
6	1	66	S	Antenna in Transition
	2	67	T	Polarization Auto/Manual in Transition
	3	68	A	Weather Select in Transition
	4	69	T	High Voltage in Transition channel A
	5	70	U	High Voltage in Transition channel B
	6	71	S	Beacon source in Transition
	7	72	&	Post Processor Auto/Manual In Transition
	8	73	C	Beacon Auto/Manual In Transition
	9	74	T	Beacon Source On-Line “1” + Mode S
	10	75	R	6 Level Weather Unavailable
	11	76	L	SCIP B Power Supply Fault (1 = Fault)
	12	77		SCIP A Power Supply Fault (1 = Fault)
	13	78	PAR	Parity
7	1	79	S	Antenna Alarm
	2	80	T	Post Processor Auto/Manual “1” = Auto
	3	81	A	Beacon Auto/Manual “1” = Auto
	4	82	T	Polarization Auto/Manual “1” = Auto
	5	83	U	Local System Control Panel Alarm
	6	84	S	Remote System control Panel #1 Alarm
	7	85		Remote System control Panel #2 Alarm
	8	86	A	SCC/Comms Alarm
	9	87	L	Channel A High Voltage On
	10	88	A	Channel B High Voltage On
	11	89	R	Channel A Ready
	12	90	M	Channel B Ready
	13	91	S	Parity

TABLE 11-11. SYSTEM CONTROL PANEL COMMUNICATIONS (Continued)

FIELD	FIELD BIT	MSG BIT	ID	ASR-9 MEANING
8	1	92		Local Panel in Control
	2	93		Remote Panel #1 In Control
	3	94	C	Remote Panel #2 In Control
	4	95	O	RMS in Control
	5	96	N	RMS Terminal ID (MSB)
	6	97	T	RMS Terminal ID (LSB)
	7	98	R	Transition Bit (For MI Use Only)
	8	99	O	Origin of MSG (Remote or Local) "1" Local
	9	100	L	MSG Sent Because of 4.8 Second Time Out (MI Only)
	10	101		CPC Number (Used for Error Checking)
	11	102		FIT Start
	12	103		FIT Start
	13	104	PAR	Parity "ODD"
9	1	105		2560 milliseconds
	2	106		1280 milliseconds
	3	107		640 milliseconds
	4	108	T	320 milliseconds
	5	109	I	160 milliseconds
	6	110	M	80 milliseconds
	7	111	E	40 milliseconds
	8	112		20 milliseconds
	9	113		SCIP a FIT Command
	10	114		Dual Redundant (1 = Yes)
	11	115		Dual Remote (1 = Yes)
	12	116		Mode S Exists (1 = Yes)
	13	117	PAR	Parity
10	1	118		128
	2	119		64
	3	120	N	32
	4	121	U	16
	5	122	M	8
	6	123	B	4
	7	124	E	2
	8	125	R	1
	9	126	S	SCIP B FIT Command
	10	127		Fault Select Override (1 = Override)
	11	128		CTS Override (1 = Override)
	12	129		Override Channel (1 = A)
	13	130	PAR	Parity

11.4 ARTS IIE FROM ASR-9 INTERFACE DESCRIPTION

11.4.1 General Information

The ARTS IIE from ASR-9 interface is an industry standard serial interface. Two independent and identical serial digital interface links are provided from each SCIP to the ARTS IIE System. Each of these digital links consists of three RS-449/RS-422 Communication Channels operating at 9600 bps. The electrical characteristics of each channel conform to EIA Standard RS-449 category I with balanced electrical characteristics as specified in EIA Standard RS-422. For the purpose of defining the SCIP to ARTS IIE interface, the SCIP is defined as the Data Circuit Terminating Equipment (DCE) per RS-449. Data transmission is only from the SCIP to the ARTS IIE.

The RS-449 (electrical RS-422) at J8 and J9 on the Remote SCIP (Unit 22) of the ASR-9 radar system is the source for the radar data. There are three surveillance data channels (SURV-1, SURV-2, and SURV-3). The data on these channels is formatted by the ASR-9 radar system, and the specific format for each type of data from the ASR-9 radar system is defined in detail in ASR-9 External Interface Control Document for the ASR-9 SCIP to Terminal Computer, Rev D, 02 October 1987, SE007-4, paragraph 3.2. Each data channel is a synchronous serial data channel operating at 9600 bps.

11.4.2 Mechanical Characteristics

The mechanical implementation for the ARTS IIE from ASR-9 SCIP interface is an interface at the SCIP at the J8 through J11 connectors on top of the SCIP cabinet. Table 11-12 provides the physical connections used for the ARTS IIE interface.

TABLE 11-12. REMOTE SCIP CONNECTORS USED FOR ARTS IIE INTERFACE

CONNECTOR NUMBER	TYPE	INTERFACE CONNECTION	REMARKS
J8	50-pin connectors	ARTS IIE CDA	SCIP A
J9	50-pin connectors	ARTS IIE CDB	SCIP A
J10	50-pin connectors	ARTS IIE CDA	SCIP B
J11	50-pin connectors	ARTS IIE CDB	SCIP B

11.4.3 Electrical Characteristics

The electrical characteristics of this interface are provided in ASR-9 External Interface Control Document for the ASR-9 SCIP to Terminal Computer, Rev. D, 02 October 1987, SE007-4, Section 3.2.2.

The signal levels for marking and spacing for the data and control to and from the converters and the serial I/O circuit card are specified in RS-422 Electrical Characteristics of Balanced Voltage Digital Interface Circuits.

11.4.4 Protocol

The meaningful RS-449 signals between SCIP and System Processors are as described in Table 11-13.

TABLE 11-13. RS 449 INTERFACE SIGNALS

SIGNAL	EIA-RS-449 IDENTIFIER	SOURCE
Receive Data	RD	SCIP
Receive Timing	RT	SCIP
Data Mode/Receiver Ready	DM/RR	SCIP

Receive Data

The data signals generated by the modem in response to data channel line signals received from a remote site are transferred on this circuit to the System Processor.

Receive Timing

The modem signals on this circuit provide the System Processor with receive signal element timing information. The transition from ON to OFF indicates the center of each Receive Data signal element. Timing information is provided whenever the modem is powered-on.

Data Mode/Receiver Ready

The Data Mode and Receiver Ready signals are tied to +5 volts in the SCIP and are used by ARTS to indicate that the SCIP interface is connected and powered up.

11.4.5 Data Format

The data formats of the messages received from the ASR-9 modems on this interface are controlled by the ASR-9 External Interface Control Document for the ASR-9 SCIP to Terminal Computer, Rev. D, 02 October 1987, SE007-4, paragraph 3.2.3.1 They include Idle; Beacon, Beacon RTQC, and Sector Mark; Search; Search RTQC; and System Status messages. The data provided in the following paragraphs is for information only.

The following five categories of messages are sent from the ASR-9 to the ARTS-IIE Computer:

a) Idle Message

b) Beacon, Beacon RTQC, and Sector Mark Message

c) Search Message

d) Search RTQC Message

e) System Status Message.

These messages are formatted as described in the detailed description of SCIP/ARTS II message formats in the following paragraphs. Data bits are transmitted from top to bottom order, field 1 being received first. The SCIP outputs “ODD” parity (except for the idle character which uses “EVEN” parity) and utilizing bit 13 of each field as the parity bit.

The Idle message is transmitted between output messages and is a 13-bit idle character to delineate messages.

11.4.5.1 Idle Message

IDLE MESSAGE

The Idle message is transmitted from the ASR-9 to delineate messages received at the SCIP. A minimum of at least one 13-bit "idle character" will be transmitted between output messages over each modem channel to maintain frame synchronization. The "idle character" will be 0001111111111 (even parity), with the bits transmitted in the left to right order, **"0"** being received first. The "idle character" will be transmitted continuously (over each channel) when output messages are not available. After establishing synchronization, bits within a message will not decode to idle messages as parity is "ODD."

TABLE 11-14. IDLE MESSAGE

WORD	WORD BIT	MSG BIT	ID	ARTS IIE MEANING	
1	1	1	M	0	
	2	2	E	0	This Message Label Field Identifies
	3	3	S	0	
	4	4	S	1	an
	5	5	A	1	
	6	6	G	1	IDLE MESSAGE
	7	7	E	1	
	8	8		1	with
	9	9	I	1	
	10	10	D	1	Even Parity
	11	11		1	
	12	12		1	
	13	13	PAR	PARITY	

11.4.5.2 Beacon, Beacon RTQC, and Sector Mark Message (91 Bits)

BEACON MESSAGE

The Beacon message contains information about a cooperating or surveillance dependent (beacon equipped) aircraft that describes beacon Mode 3/A or Mode 2 code, altitude, position, characteristics, and identification.

BEACON RTQC

The Beacon RTQC message is an internally generated test target that is used to indicate the quality of beacon data being processed by the ASR-9. The message format is the same as the beacon message format with the exception of bit 1 (Test) being set to a "1".

SECTOR MARK

The Sector Mark message provides azimuth positional information concerning the ASR-9s bearing. Thirty-two (0-31) messages are transmitted each scan in azimuth wedges of 11.25 degrees or 128 ACPs to synchronize the ARTS IIE ATC computer with the position of the ASR-9 radar antenna. Bit 12 of the BRTQC formatted message distinguishes the Sector Mark from the BRTQC message.

TABLE 11-15. BEACON, RTQC, AND SECTOR MARK MESSAGE

FIELD	FLD BIT	MSG BIT	ID	ARTS IIE MEANING	
1	1		BCN	0 = Beacon Target Report 1 = Beacon RTQC	
	2	2	ID	1 Beacon Message Identifier	
	3	3	ID	1 Beacon Message Identifier	
	4	4	M2VAL	1 = Meets Mode 2 Validation Threshold of ASR-9 0 = Does Not meet Mode 2 Validation Threshold of ASR-9	
	5	5	M3VAL	Mode 3/A Validation	
	6	6	M3VAL	Mode 3/A Validation	
	7	7	IDENT	1 = Validated Ident response Mode 3 or 2	
	8	8	R/R	Search Reinforced. 1 = Search Merged w/Beacon	
	9	9	EMER	1= 7700 Civil or Military Emergency	
	10	10	EMER	1= 7600 Civil or Military Radio Failure	
	11	11	3XVAL	1 = Validated Mode 3 "X" Response	
	12	12	SECT	1 = Sector Mark message	
	13	13	PAR	Parity "ODD"	
2	1	14		32 NM	
	2	15	R	16 NM	Range
	3	16		8 NM	
	4	17	A	4 NM	of the
	5	18		2 NM	
	6	19	N	1 NM	Beacon RTQC
	7	20		1/2 NM	
	8	21	G	1/4 NM	or
	9	22		1/8 NM	
	10	23	E	1/16 NM	Beacon Report
	11	24		1/32 NM	
	12	25		1/64 NM	
	13	26	PAR	Parity "ODD"	
3	1	27		2048 ACPs	
	2	28		1024 ACPs	Azimuth of the
	3	29		512 ACPs	
	4	30	A	256 ACPs	Beacon RTQC
	5	31	Z	128 ACPs	
	6	32	I	64 ACPs	Beacon Report
	7	33	M	32 ACPs	
	8	34	U	16 ACPs	or
	9	35	T	8 ACPs	
	10	36	H	4 ACPs	Beacon Sector Mark
	11	37		2 ACPs	
	12	38		1 ACP	
	13	39	PAR	Parity "ODD"	

TABLE 11-15. BEACON, RTQC, AND SECTOR MARK MESSAGE (Continued)

FIELD	FLD BIT	MSG BIT	ID	ARTS IIE MEANING
4	1	40	QUAL	4 ACPs > SRB ARTS IIIA Quality (Beacon)
	2	41	QUAL	2 ACPs > SRB Beacon Run Length Above Threshold
	3	42	QUAL	1 ACP > SRB (SBR) Counts Greater than 7=7
	4	43	DSCRE	1 = Discrete Mode 3/A Code Info in C and D fields
	5	44	2XVAL	1 = Validated Mode 2 “X” Responses.
	6	45	BNC Hit Cnt	16 BCN Hits
	7	46	BNC Hit Cnt	8 BCN Hits Number of Beacon Replies
	8	47	BNC Hit Cnt	4 BCN Hits That Created the
	9	48	BNC Hit Cnt	2 BCN Hits Beacon Report
	10	49	BNC Hit Cnt	1 BCN Hits
	11	50	MCVAL	Mode C Validation
	12	51	MCVAL	Mode C Validation
	13	52	PAR	Parity “ODD”
5	1	53	A4	
	2	54	A2	MODE 3/A Code (OCTAL)
	3	55	A1	
	4	56	B4	
	5	57	B2	
	6	58	B1	
	7	59	C4	Uniquely identifies the Beacon Target
	8	60	C2	
	9	61	C1	
	10	62	D4	
	11	63	D2	
	12	64	D1	
	13	65	PAR	Parity
6	1	66	D4	
	2	67	C1	MODE 2 Code (OCTAL)
	3	68	A1	
	4	69	C2	
	5	70	A2	
	6	71	C4	
	7	72	A4	Uniquely identifies the Beacon Target
	8	73	B1	
	9	74	D1	
	10	75	B2	
	11	76	D2	
	12	77	B4	
	13	78	PAR	Parity “ODD”

TABLE 11-15. BEACON, RTQC, AND SECTOR MARK MESSAGE (Continued)

FIELD	FLD BIT	MSG BIT	ID	ARTS IIE MEANING
7	1	79	SIGN	1 = Negative Altitude and 2's Complement Form
	2	80	ALTITUDES 100s FEET	102,400 feet
	3	81	ALTITUDES 100s FEET	51,200 feet
	4	82	ALTITUDES 100s FEET	25,600 feet
	5	83	ALTITUDES 100s FEET	12,800 feet Mode C Altitude
	6	84	ALTITUDES 100s FEET	6,400 feet
	7	85	ALTITUDES 100s FEET	3,200 feet
	8	86	ALTITUDES 100s FEET	1,600 feet
	9	87	ALTITUDES 100s FEET	800 feet Identifies the Altitude
	10	88	ALTITUDES 100s FEET	400 feet of the Target Report
	11	89	ALTITUDES 100s FEET	200 feet
	12	90	ALTITUDES 100s FEET	100 feet
	13	91	PAR	Parity "ODD"

11.4.5.3 Search Message

The Search (Radar) message contains information that describes the position, characteristics, and identification of a radar report when not merged with a beacon (not radar reinforced). Generally the report is from aircraft but may be false from non-aircraft reflections (weather, clutter) or noise.

Search messages that are not tracked by the ASR-9 Surveillance Processor and not merged with a beacon are labeled uncorrelated, and search messages that are tracked are called correlated reports. Search messages can be eliminated from the data sent to the ARTS IIE system by a maintenance adjustment in the SCIP that prevents search messages from passing to the ARTS IIE output.

TABLE 11-16. SEARCH MESSAGE (52 BITS)

FIELD	FIELD BIT	MSG BIT	ID	ARTS IIE MEANING	
1	1	1	TEST	Active when the ASR-9 data is from an unavailable channel (not operational)	
	2	2	M	0	
	3	3	E	0	
	4	4	S	1	Search
	5	5	S	1	
	6	6	A	0	Message
	7	7	G	1	
	8	8	E	1	Label
	9	9		0	
	10	10	I	0	
	11	11	D	0	
	12	12		0	
	13	13	PAR	Parity “ODD”	
2	1	14		32 NM	
	2	15	R	16 NM	Range
	3	16		8 NM	
	4	17	A	4 NM	of the
	5	18		2 NM	
	6	19	N	1 NM	Radar Report
	7	20		1/2 NM	
	8	21	G	1/4 NM	
	9	22		1/8 NM	
	10	23	E	1/16 NM	
	11	24		1/32 NM	
	12	25		1/64 NM	
	13	26	PAR	Parity “ODD”	
3	1	27		2048 ACPs	
	2	28		1024 ACPs	Azimuth of the
	3	29		512 ACPs	
	4	30	A	256 ACPs	
	5	31	Z	128 ACPs	
	6	32	I	64 ACPs	Radar Report
	7	33	M	32 ACPs	
	8	34	U	16 ACPs	
	9	35	T	8 ACPs	
	10	36	H	4 ACPs	
	11	37		2 ACPs	
	12	38		1 ACP	
	13	39	PAR	Parity “ODD”	

TABLE 11-16. SEARCH MESSAGE (52 BITS) (Continued)

FIELD	FIELD BIT	MSG BIT	ID	ARTS-IIE MEANING
4	1	40	QUAL	00 = One CPI Report
	2	41	QUAL	01 = Two CPI Reports of Different Types (both PRFs)
				10 = Two or more CPI Reports, same PRF
				11 = Three or more CPI Reports, both PRFs
	3	42	CONF	000 Targets are in Road Traffic Map Areas
	4	43	CONF	001 Targets in Heavy Clutter. 010 = Interference
	5	44	CONF	011 Thermal, Angel False Targets and Aircraft <“R”
				101 Thermal, Angel False Targets and Aircraft >“R”
				100 Maximum Doppler from Zero Filter
	6	45	TRACK	<u>TRACKING ELIGIBILITY</u>
	7	46	TRACK	00 =(vehicles) Do Not Track 01= Track Correlation
				10 = Track Initiation and Correlation
	8	47	QUAL	<u>ARTS IIIA QUALITY</u>
	9	48	QUAL	Determined from Target Confidence and Quality
	10	49	QUAL	Determined from Target Confidence and Quality
	11	50	ZERO	Set to Zero
	12	51	CORRL	0 = Uncorrelated 1 = Correlated (Tracked)
	13	52	PAR	Parity “ODD”

11.4.5.4 Search RTQC Message

<u>SEARCH RTQC</u>.

The SRTQC message is an ASR-9 internally generated test message injected once per scan to provide a measure of the quality of radar reports being received from the ASR-9. The SRTQC message contains information that describes the position, characteristics, and identification of the test target.

TABLE 11-17. SEARCH RTQC MESSAGE (52 BITS)

FIELD	FIELD BIT	MSG BIT	ID	ARTS IIE MEANING	
1	1	1	M	1	This Message Label Field Identifies
	2	2	E	0	
	3	3	S	0	
	4	4	S	1	Search RTQC
	5	5	A	0	
	6	6	G	0	Message
	7	7	E	1	
	8	8		0	
	9	9	I	0	
	10	10	D	0	
	11	11	ZERO	Set to Zero	
	12	12	SECT	Set to Zero	
	13	13	PAR	Parity "ODD"	
2	1	14		32 NM	
	2	15	R	16 NM	Range
	3	16		8 NM	
	4	17	A	4 NM	of the
	5	18		2 NM	
	6	19	N	1 NM	Search RTQC
	7	20		1/2 NM	
	8	21	G	1/4 NM	
	9	22		1/8 NM	
	10	23	E	1/16 NM	
	11	24		1/32 NM	
	12	25		1/64 NM	
	13	26	PAR	Parity "ODD"	
3	1	27		2048 ACPs	
	2	28		1024 ACPs	Azimuth of the
	3	29		512 ACPs	
	4	30	A	256 ACPs	Search RTQC
	5	31	Z	128 ACPs	
	6	32	I	64 ACPs	
	7	33	M	32 ACPs	
	8	34	U	16 ACPs	
	9	35	T	8 ACPs	
	10	36	H	4 ACPs	Beacon Sector Mark
	11	37		2 ACPs	
	12	38		1 ACP	
	13	39	PAR	Parity "ODD"	

TABLE 11-17. SEARCH RTQC MESSAGE (52 BITS) (Continued)

FIELD	FIELD BIT	MSG BIT	ID	ARTS IIE MEANING
4	1	40	QUAL	00 = One CPI Report
	2	41	QUAL	01 = Two CPI Reports of Different Types (both PRFs)
				10 = Two or more CPI Reports, same PRF
				11 = Three or more CPI Reports, both PRFs
	3	42	CONF	000 Targets are in Road Traffic Map Areas
	4	43	CONF	001 Targets in Heavy Clutter. 010 = Interference
	5	44	CONF	011 Thermal, Angel False Targets and Aircraft <“R”
				101 Thermal, Angel False Targets and Aircraft >“R”
				100 Maximum Doppler from Zero Filter
	6	45	TRACK	TRACKING ELIGIBILITY
	7	46	TRACK	00 =(vehicles) Do Not Track 01= Track Correlation
				10 = Track Initiation and Correlation
	8	47	QUAL	ARTS IIIA QUALITY
	9	48	QUAL	Determined from Target Confidence and Quality
	10	49	QUAL	Determined from Target Confidence and Quality
	11	50	ZERO	Set to Zero
	12	51	CORRL	0 = Uncorrelated 1 = Correlated (Tracked)
	13	52	PAR	Parity “ODD”

TABLE 11-18. SYSTEM STATUS MESSAGE

FIELD	FIELD BIT	MSG BIT	ID	ARTS IIE MEANING
1	1	1	M	0
	2	2	E	0
	3	3	S	0
	4	4	S	1 Status
	5	5	A	1
	6	6	G	0 Message
	7	7	E	0
	8	8		0 Label
	9	9	I	0
	10	10	D	0
	11	11		0
	12	12		0
	13	13	PAR	Parity “ODD”

TABLE 11-18. SYSTEM STATUS MESSAGE (Continued)

FIELD	FIELD BIT	MSG BIT	ID	ARTS IIE MEANING
2	1	14	S	Channel On-Line (1=Channel A)
	2	15	T	Channel A alarm (1= Alarm)
	3	16	A	Channel A Unavailable (1= Unavailable)
	4	17	T	Channel B alarm (1= Alarm)
	5	18	U	Channel B Unavailable (1= Unavailable)
	6	19	S	Post Processor On-Line (1 = Channel A)
	7	20		Post Processor A (1= Alarm)
	8	21	A	Post Processor A Unavailable (1= Unavailable)
	9	22	L	Post Processor B (1= Alarm)
	10	23	A	Post Processor B Unavailable (1= Unavailable)
	11	24	R	Wx Processor On-Line (1 = 6 Level On-Line)
	12	25	M	Wx Channel Alarm (1 = Alarm)
	13	26	S	Parity "ODD"
3	1	27	S	High Voltage (1 = HV ON)
	2	28	T	Antenna Polarization 0 = LP, 1 = CP
	3	29	A	Antenna Rotation (1 = Antenna Rotating)
	4	30	T	SCIP On-Line; 1 = SCIP A; 0 = SCIP B (IND.SCIP)
	5	31	U	SCIP Channel A Alarm (1 = Alarm)
	6	32	S	SCIP Channel B Alarm (1 = Alarm)
	7	33		Maintenance Alarms (1 = Alarm)
	8	34	A	COMM Link A Alarms (1 = Alarm)
	9	35	L	COMM Link B Alarms (1 = Alarm)
	10	36	A	RMS Alarm
	11	37	R	Spare
	12	38	M	Spare
	13	39	S	Parity "ODD"
4	1	40	S	Beacon Channel (ATCBI/Mode S) On-Line (1 = Channel A)
	2	41	T	Beacon Channel (ATCBI/Mode S) A Alarm
	3	42	A	Beacon Channel (ATCBI/Mode S) B Alarm
	4	43	T	Reserved for Mode S
	5	44	U	Reserved for Mode S To
	6	45	S	Reserved for Mode S
	7	46		Reserved for Mode S Be
	8	47	A	Reserved for Mode S
	9	48	L	Reserved for Mode S Updated
	10	49	A	Reserved for Mode S
	11	50	R	Reserved for Mode S When Available
	12	51	M	Reserved for Mode S
	13	52	S	Parity "ODD"

Section 12
MODE S BEACON RADAR SYSTEM INTERFACE

12.1 GENERAL DESCRIPTION

The Mode S Beacon Radar interface with the ARTS IIE system is a serial external interface. Figure 12-1 illustrates an overall view of the Mode S interface. This is an ARTS IIE only interface. It is used at sites that do not have ASR-9s but do have a Mode S beacon system.

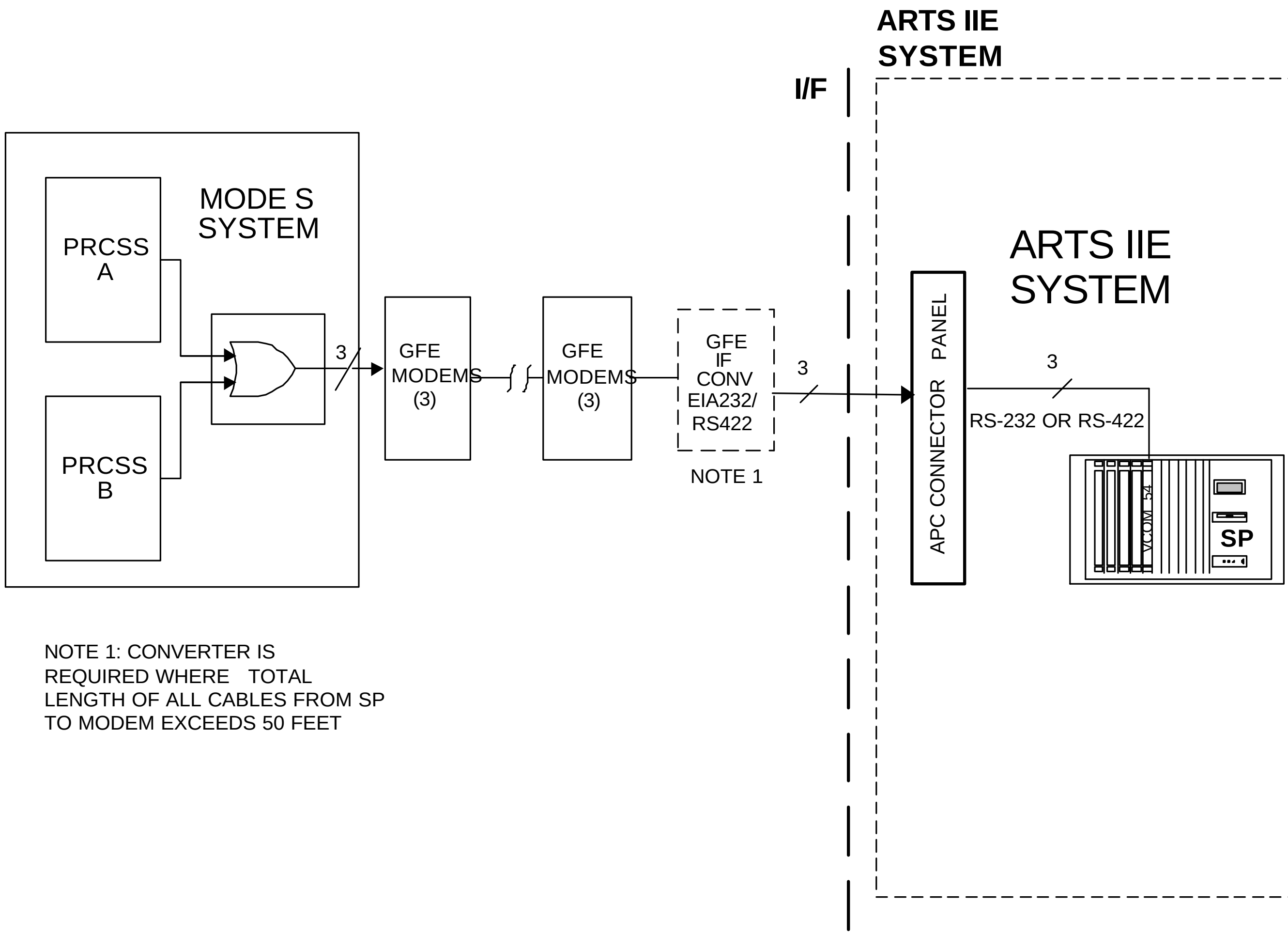


FIGURE 12-1. MODE-S/ARTS IIE INTERFACE BLOCK DIAGRAM

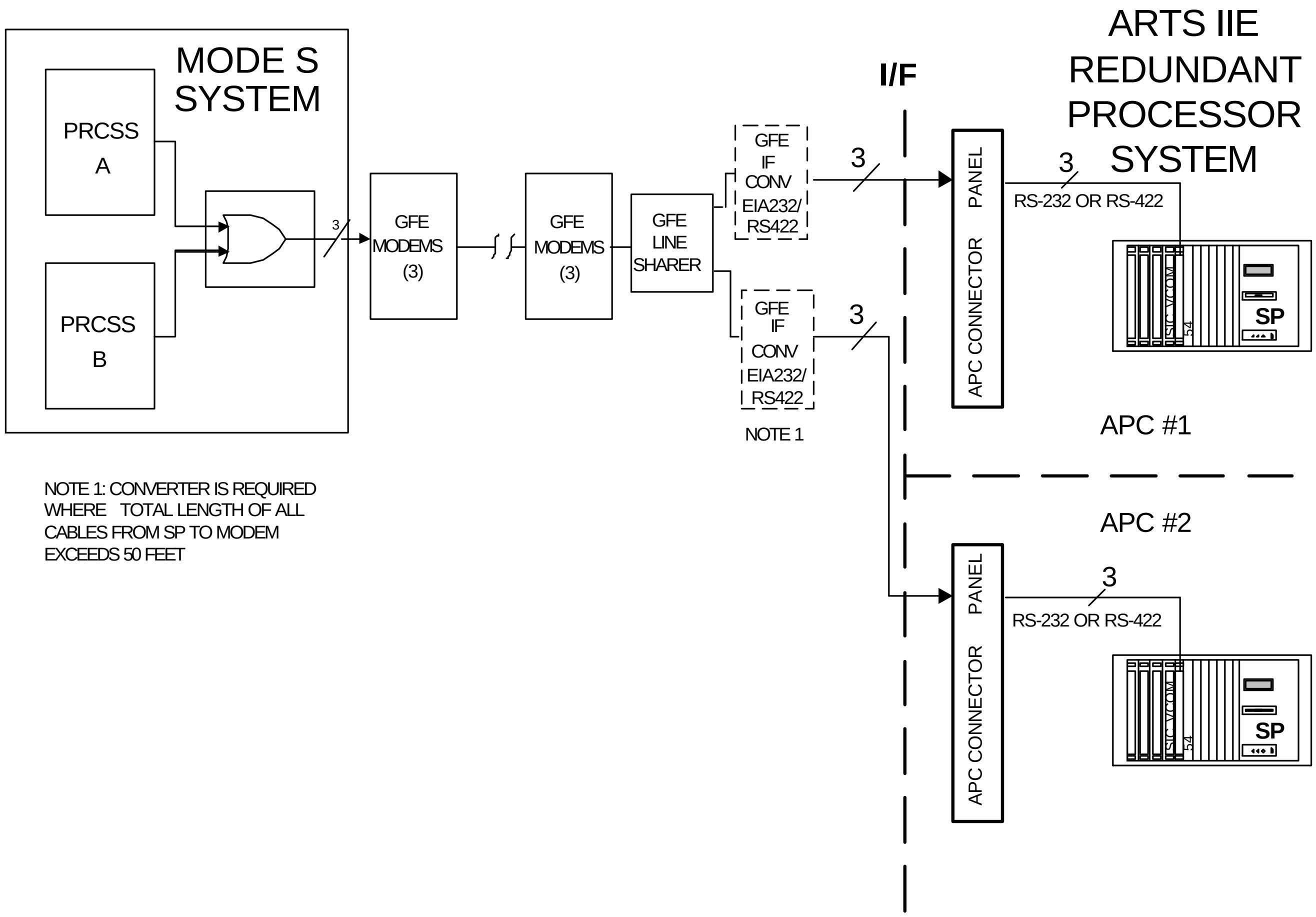


FIGURE 12-2. MODE S/ARTS (WITH REDUNDANT PROCESSORS) IIE INTERFACE BLOCK DIAGRAM

12.2 REFERENCED DOCUMENTS

12.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

12.2.1.1 Applicable Government Documents

Specifications

None.

Standards

None.

Other Publications

TM-PA-0018/071/03 External Interface Control Document for Mode S to ASR-7/ARTS IIA Terminal Sites, 16 March 1987

TM-PA-0018/072/03	External Interface Control Document for Mode S to ASR-8/ARTS IIA Terminal Sites., 16 March 1987

12.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

EIA-RS-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Exchange
EIA-RS-422-A	Electrical Characteristics of Balanced Voltage Digital Interface Circuits, December 1978
EIA-RS-449	General Purpose 37-Position and 9-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange, January 1978 (Reaffirmed)
EIA-TIA-530-A	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Including Alternative 26-Position Connector, (ANSI/TIA-530-A-92), June 1992

Other Publications

ATCxxxx	Design Specification for the Mode S Beacon Radar Processor System
TI xxxxx	Technical Manual for Mode S Beacon Radar Processor

12.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-90-C-00057	ARTS IIA Interim Support Program for Air Traffic Control Facilities

FAA Specifications

FAA-E-2570d	Automated Radar Terminal Air Traffic Control System ARTS IIA (draft)

FAA Computer Program Functional Specifications

NAS-MD 636	Beacon/ Radar Input Processing

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

12.3 MODE S BEACON RADAR INTERFACE DESCRIPTION

12.3.1 General Information

The Mode S to ARTS IIE interface is an industry standard serial interface. The Mode S provides an RS-232 interface from the GFE modems/line sharers/converters to the ARTS IIE system. At the ARTS IIE system, the signals from the Mode S are received at the APC connector panel, routed through the BT7-ITM24 board, and terminated at the ports on the VCOM 54 board. There are three (3) surveillance data channels from the Mode S system. The data provided by these channels is defined in detail in External Interface Control Document for Mode S to ASR-7/ARTS IIA Terminal Sites, and in External Interface Control Document for Mode S to ASR-8/ARTS IIA Terminal Sites. Each data channel is a synchronous serial data channel operating at 9600 bps.

Since RS-232 restricts cable lengths to 50 feet, the total length of GFE cables from the APC connector panel to the GFE modems or converters must be less than 47 feet (50 feet minus 3 feet for internal ARTS IIE cabling). For distances that require total cable length longer than 50 feet, the RS-422 interface option within the BT7-ITM24 board in the System Processor must be selected, and GFE interface converters must be used near the modem equipment to convert each of the three interfaces from RS-232 to EIA-530.

12.3.2 Mechanical Characteristics

The ARTS IIE system provides three 25-pin RS-232/EIA-530 DTE interface connectors at the APC connector panel for physical interface to the Mode S system. The cables are terminated with 25-position DTE interface connectors at the ARTS IIE end, and 25-position DCE connectors at the modem end.

12.3.3 Electrical Characteristics

The electrical interface from the GFE communications equipment is RS-232. The signal levels for marking and spacing for the data and control to and from the converters and the serial I/O circuit card are specified in RS-232-C. Where the GFE Level Converters are used, the electrical characteristics between the converters and the ARTS IIE system will be in accordance with EIA-530.

12.3.4 Protocol

The meaningful EIA-530/RS-232 signals between the GFE equipment and the ARTS IIE are as described in Table 12-1.

TABLE 12-1. RS-232/EIA-530 INTERFACE SIGNALS

SIGNAL	EIA-530/RS-232 IDENTIFIER	SOURCE
Receive Data	RD	GFE equipment
Receive Timing	RT	GFE equipment
Data Mode/Receiver Ready	DM/RR	GFE equipment
Terminal Ready	TR	ARTS IIE

<u>Receive Data</u>

The data signals generated by the modem in response to data channel line signals received from a remote site are transferred on this circuit to the System Processor.

Receive Timing

The modem signals on this circuit provide the System Processor with receive signal element timing information. The transition from ON to OFF indicates the center of each Receive Data signal element. Timing information is provided whenever the modem is powered on.

Data Mode/Receiver Ready

The Data Mode and Receiver Ready signals simply are tied to +5 volts in the SCIP and are used by ARTS to indicate that the GFE equipment interface is connected and powered up.

Terminal Ready

This is an output single from the ARTS IIE that can be used by the GFE to indicate that the ARTS IIE is ready to receive data.

Link Level Protocol and Format.-. Surveillance messages, compatible with CD-2 format, are composed of 13-bit words (12 bits plus parity); transmission requires that at least one synchronization word, shown in Figure 12-3, is transmitted between messages and during the period when no messages are being sent. Message types are not transmitted in any specified order and are shipped on a first-in/first-out basis.

12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	1	1	1	1	1	1	1	1	1	P=1

FIGURE 12-3. SYNCHRONIZATION WORD

12.3.5 Data Format

The data formats of the messages received from the Mode S on this interface are provided in detail in External Interface Control Document for Mode S to ASR-7/ARTS IIA Terminal Sites and in External Interface Control Document for Mode S to ASR-8/ARTS IIA Terminal Sites. They include Idle, Beacon, Search, and System Status messages. The data provided in the following paragraphs is for information only.

The Mode S sensor surveillance link interface transmits surveillance data to ATC facilities in the CD-2 formats specified in FAA-E-2679a. The ASR-7/ASR-8-ARTS IIA surveillance link provides the following message types:

a. Beacon

b. Beacon RTQC

c. Search RTQC

d. Mode S Status.

Surveillance message words contain 13 bits, 12 data bits and an odd parity bit (Msg. bit 0). Messages consist of four words, except the Beacon and Beacon RTQC messages, which contain seven words each. Bits are numbered from 0 to 12 with bit 12 being the MSB. Bit 12 is transmitted first in a word.

12.3.5.1 Beacon Message

Beacon targets are both ATCRBS and Mode S, and the reports from these targets are used to generate Beacon messages (see Figure 12-4). The same format is used for Beacon RTQC messages (see Figure 12-5).

Word 1	Message Label	Bits 12-10	0 1 1 indicates a Beacon message. 1 1 1 indicates a Beacon RTQC message.
	MODE 2	Bit 9	Set to 1 for Mode 2 reports with all confidence bits high; set to 0 for all other Mode 2 reports, and non-Mode 2 reports.
	MODE 3/A VALIDATION	Bits 8, 7	This field indicates the validity of the Mode 3/A code data. For ATCRBS targets, if the sensor indicates Mode 3/A code confidence as all high confidence, then the data is valid, and this field is set to all 1's (11). If the code confidence is not all high confidence, or if the Mode 3/A code data is not present, then the data is not valid, and this field is set to all 0's (00). The sensor may replace the Mode 3/A code of an ATCRBS report with the Mode 3/A code from a track. When this happens, the Mode 3/A confidence bits from the track are used, instead of the report code confidence bits, to validate the report code according to the above ATCRBS target rules. For Mode S targets, the ATCRBS 3/A code is acquired by the sensor in a different way than for ATCRBS targets. As long as there is a 3/A code in the surveillance file for a Mode S target, that code is present and valid, and this field is set to all 1's. If the code is not present, this field is set to all 0's.
	SPI	Bit 6	This field is the SPI bit in the Mode S sensor. For ATCRBS targets, this is set to 1 when the SPI bit is 1 with high confidence. For Mode S targets, this is set to 1 when the FS field in Mode S reply indicates the identify (SPI) function

is

set in the transponder. Otherwise this field is set to 0.

	R/R (Radar Reinforced)	Bit 5	When set to 1, indicates that a radar report reinforced the beacon data (no radar data is reported). (Not applicable at these sites.)
	7700	Bit 4	When set to 1, indicates a Mode 3/A aircraft emergency.
	7600	Bit 3	When set to 1, indicates a Mode 3/A aircraft radio failure.
	FAA	Bit 2	Used to report Mode 3/A "x" bit.
	AF	Bit 1	When set to 1 in a Beacon RTQC message, indicates an RTQC sector synchronization.
Word 2	Terminal Range	Bits 12-1	Twelve-bit binary integer defining range in nautical miles. MSB*=32 LSB*=1/64 NOTE: * MSB - Most Significant Bit LSB - Least Significant Bit
Word 3	Azimuth	Bits 12-1	Twelve-bit binary integer defining azimuth in ACPs, measured from true north. MSB=2048 (180°) LSB=1 (approximately .088°). If message is an RTQC sector synchronization message, azimuth setting represents the antenna position. The values are every 11.25° increment (0°, 11.25°, 22.5° ,...) from north (zero) to 348.75°. The MSB of this field is 180°.
Word 4	ARTS IIIA Quality	Bits 12, 11, 10	<u>Condition</u> / <u>Setting</u> Mode 3/A Validation — 111 = all 1's Mode 3/A Validation — 011 = zero
	DISC	Bit 9 (Discrete)	When set to 1, indicates report is based on replies with discrete Mode 3/A codes.
	MODE 2'x'	Bit 8	When set to 1, indicates valid Mode 2 "x" responses.
	Beacon Hit Count	Bits 7-3	This field is an unsigned binary integer. The settings are given in decimal. The settings of this field and related conditions are listed below:

Condition	Setting
ATCRBS, meets FAA-E-2716, 3.4.6.4.14(a)	20
ATCRBS, meets FAA-E-2716, 3.4.6.4.14(b)	18
ATCRBS, flagged as code in transition	8
ATCRBS, uncorrelated, code all high confidence	16
ATCRBS, other than above	7
Mode S target report.	21

	MODE C VALIDATION	Bits 2-1	This field indicates the validity of the Mode S altitude data. For ATCRBS reports, if the sensor has successfully decoded the Mode C data for a report, then the data is valid, and this field is set to 11. If the sensor has not successfully decoded the Mode C data, or if the Mode C data is not present, then the data is not valid, and this field is set to 00.
Word 5	MODE 3/A BEACON CODE	Bits 12-1	Contains the Mode 3/A code of the target if the Mode 3/A Valid indicator is set to 11; otherwise it contains 0's.
Word 6	MODE 2 BEACON CODE	Bits 12-1	Contains the Mode 2 code of the target if the Mode 2 indicator is set to 1; otherwise it contains 0's.
Word 7	MODE C ALTITUDE	Bits 12-1	Contains the reported Mode C altitude of the target (in feet) if the Mode C valid indicator is set to 11; otherwise it is set to all 0's. It is set encoded as a two's complement number with: MSB=102, 400 and LSB= 100. Bit 12 is the sign bit where 0 = + and 1 = -.

WORD 1

FIRST MSG BIT — MSG BIT 13

12	11	10	9	8	7	6	5	4	3	2	1	0
0	1	1	MODE 2	MODE 3A VALIDATION		SPI	R/R	7700	7600	MODE 3/A "x"	0	P

WORD 2

MSG BIT 14 — MSG BIT 26

TERMINAL RANGE (NM)

32	16	8	4	2	1	1/2	1/4	1/8	1/16	1/32	1/64	P

WORD 3

MSG BIT 27 — MSG BIT 39

AZIMUTH (acp): acp=4AU(0.088 degree)

2048	1024	512	256	128	64	32	16	8	4	2	1	P"

WORD 4

MSG BIT 40 — MSG BIT 52

ARTS III QUALITY	DISC	MODE 2 "X"	BEACON HIT COUNT	MODE C VALIDATION	P

WORD 5

MSG BIT 53 — MSG BIT 65

MODE 3/A BEACON CODE

A4	A2	A1	B4	B2	B1	C4	C2	C1	D4	D2	D1	P

WORD 6

MSG BIT 66 — MSG BIT 78

MODE 2 BEACON CODE

D4	C1	A1	C2	A2	C4	A4	B1	D1	B2	D2	B4	P

WORD 7

MSG BIT 79 — MSG BIT 91

MODE C ALTITUDE (FT)

SIGN	102400	51200	25600	12800	6400	3200	1600	800	400	200	100	P

FIGURE 12-4. BEACON MESSAGE

12.3.5.2 Beacon RTQC Message

Mode S reports the Beacon Real Time Quality Control (RTQC) target using the same message format as used for the beacon target (Figure 12-4).

The beacon RTQC target is not a real target or a test target; it exists only as a surveillance message. The data for the RTQC Target message is site adaptable. The RTQC target shall not be reported (an RTQC message) when the sensor is in a Red condition. The RTQC Target message (Figure 12-5) shall be placed in the output data stream at the time that normal surveillance messages (if any), having azimuths within +128 Au of the RTQC azimuth, would be placed in the output data stream.

For sector sync messages, all fields will be set to 0 except for message label, AF bit, and the azimuth.

WORD 1 — FIRST MSG BIT … MSG BIT 13

12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	1	MODE 2	MODE 3A VALIDATION		SPI	0	0	0	FAA	AF	P

WORD 2 — MSG BIT 14 … MSG BIT 26

TERMINAL RANGE (NM)

32	16	8	4	2	1	1/2	1/4	1/8	1/16	1/32	1/64	P

WORD 3 — MSG BIT 27 … MSG BIT 39

AZIMUTH (ACP)

2048	1024	512	256	128	64	32	16	8	4	2	1	P"

WORD 4 — MSG BIT 40 … MSG BIT 52

BEACON RUN LENGTH (ACP) TIME IN STORAGE (SEC)

64	32	16	8	4	2	4	2	1	1//2	R/L= 1	0	P

WORD 5 — MSG BIT 53 … MSG BIT 65

MODE 3/A BEACON

A4	A2	A1	B4	B2	B1	C4	C2	C1	D4	D2	D1	P

WORD 6 — MSG BIT 66 … MSG BIT 78

0	0	0	0	0	0	0	0	0	0	0	0	P

WORD 7 — MSG BIT 79 … MSG BIT 91

0	0	0	0	0	0	0	0	0	0	0	0	P

FIGURE 12-5. BEACON RTQC MESSAGE

12.3.5.3 Search RTQC Message

The Search RTQC message (see Figure 12-5) is used to send a Search RTQC sector synchronization message. The sensor shall create its own search RTQC message. All fields shall be set to zero except for message label, AF bit, and azimuth.

The message shall be issued in parallel to, or as the next message after, the beacon RTQC sector synchronization message with matching azimuth.

Word 1	Not Used	Bit 12	Set to 1.
	Message label	Bits 11-3	0 0 1 0 0 1 0 0 0 indicates a Search RTQC message.
	FM	Bit 2	Set to 0.
	AF	Bit 1	Set to 1, indicating a sector synchronization message.
Word 2 search	TERMINAL RANGE	Bits 12-1	Set to 0, Terminal range represents the range of the target in NM. LSB -1/64 NM.
Word 3	AZIMUTH	Bits 12-1	Twelve-bit binary integer defining azimuth in ACPs, measured from true north. MSB-2048 (180°). and LSB=1 (approx. 0.088°)
Word 4	Radar Quality	Bits 12-11	Set to 0.
	Radar Confidence	Bits 10-8	Set to 0.
	Tracking Eligibility	Bits 7-6	Set to 0.
	ARTS IIIA Radar Quality	Bits 5-3	Set to 0.
	Spare	Bit 2	Set to 0.
	Scan to Scan Correlated	Bit 1	Set to 0.

WORD 1 — FIRST MSG BIT — MESSAGE LEVEL — MSG BIT 13

12	11	10	9	8 7	6	5	4	3	2	1	0	
1	0	0	1	0 0	1	0	0	0	FAA	AF	P	

WORD 2 — MSG BIT 14 — TERMINAL RANGE (NM) — MSG BIT 26

32	16	8	4	2	1	1/2	1/4	1/8	1/16	1/32	1/64	P

WORD 3 — MSG BIT 27 — AZIMUTH (ACP) — MSG BIT 39

2048	1024	512	256	128	64	32	16	8	4	2	1	P"

WORD 4 — MSG BIT 40 — RUN LENGTH (ACP) TIME IN STORAGE (SEC) — MSG BIT 52

256	128	64	32	16	8	4	2	1	1/2	1/4	1/8	P

FIGURE 12-6. SEARCH RTQC MESSAGE

12.3.5.4 Mode S Status Message

The Mode S Status message (see Figure 12-6) is used to send the status of Mode S. The setting of the beacon status is discussed below. Since there is no primary radar to Mode S connectivity in this configuration, there will be no radar status reports. The search status fields are set to indicate failure of the radar as shown below.

Word 1	Test	Bit 12	When set to 1, indicates a test report
	Message Label	Bits 11-3	. 0 0 0 1 1 0 0 0 0 indicates a Status

message.

	Not Used	Bit 2	Set to 0.
	Not Used	Bit 1	Set to 0.
Word 2	Channel On-Line	Bit 12	Set to 0.
	Channel A Alarm	Bit 11	Set to 0.
	Channel A Unavailable	Bit 10	Set to 0.
	Channel B Alarm	Bit 9	Set to 0.
	Channel B Unavailable	Bit 8	Set to 0.
	Post Proc. Online	Bit 7	Set to 0.
	Post Proc. A Alarm	Bit 6	Set to 1.
	Post Proc. A Unavailable	Bit 5	Set to 1.
	Post Proc. B Alarm	Bit 4	Set to 1.
	Post Proc. B Unavailable	Bit 3	Set to 1.
	WX Proc. On Line	Bit 2	Set to 0.
	WX Channel Alarm	Bit 1	Set to 0.
Word 3	High Voltage On	Bit 12	Set to 0.
	Antenna Polarization	Bit 11	Set to 0.
	Antenna Rotation	Bit 10	Set to 0.
	SCIP On-line	Bit 9	Set to 0.
	SCIP Chan A Alarm	Bit 8	Set to 0.
	SCIP Chan B Alarm	Bit 7	Set to 0.
	Maintenance Alarm	Bit 6	Set to 0.
	Comm Link A Alarm	Bit 5	Set to 0.
	Comm Link B Alarm	Bit 4	Set to 0.
	RMS Alarm	Bit 3	Set to 0.
	Spare	Bits 2-1	Set to 0.
Word 4 set	Beacon Channel On-Line	Bit 12	When set to 1 indicates channel A is active; when set to 0 indicates channel B is active.
	Beacon Channel A Alarm	Bit 11	Set to 1 when channel A is in red condition.
	Beacon Channel B Alarm	Bit 10	Set to 1 when channel B is in red condition.
	Reserved for Mode S	Bits 9-1	9 Mode S Channel A unavailable. 8 Mode S Channel B unavailable. 7 Mode S Ch. A Interrogator Summary Alarm. 6 Mode S Ch. B Interrogator Summary Alarm.

5 Mode S Ch. A Comm Subsystem Summary Alarm.

4 Mode S Ch. B Comm Subsystem Summary Alarm.

3 Mode S Ch. A Computer Subsystem Summary Alarm.

2 Mode S Ch. B Computer Subsystem Summary Alarm.

1 Mode S Ch. A or B Maintenance Alarm.

FIRST MSG BIT — MESSAGE LABEL — MSG BIT 13

WORD 1

12	11	10	9	8	7	6	5	4	3	2	1	0	
TEST	0	0	0	1	1	0	0	0	0	0	0	P	

MSG BIT 14 — MSG BIT 26

WORD 2

CHAN ON-LN	CHAN A ALM	CHAN A UNV	CHAN B ALM	CHAN B UNV	P. P. ON-LN	P. P. A ALM	P. P. A UNV	P. P. B ALM	P.P. B UNV	WX PROC ON-LN	WX CHAN ALM	P

MSG BIT 27 — MSG BIT 39

WORD 3

HIGH VOLT ON	ANTI POL-ARIZ	ANTI ROTA	SCIP ON-LINE	SCIP CH A ALARM	SCIP CH B ALARM	MAIN ALARM	COMM LINK A ALM	COMM LINK B ALM	RMS ALARM	SPARE 0		P

MSG BIT 40 — MSG BIT 52

WORD 4

BEAC CHAN ON LN	BEAC CHAN A ALM	BEAC CHAN B ALM		R E S E R V E	F O R	M O D E	S				P	

FIGURE 12-7. MODE S STATUS MESSAGE

Section 13
AIR ROUTE SURVEILLANCE RADAR SYSTEM INTERFACE

13.1 GENERAL DESCRIPTION

The overall view of the external interface between the ARTS system and the Air Route Surveillance Radar (ARSR) acquisition subsystem is illustrated Figure 13-1.

The ARTS IIIE configuration of the ARTS system provides a serial interface to the ARSR. The ARTS NAS-MD-636 Beacon/Radar Input Processing CPFS describes the processing for this interface for the ARTS system. The message types are fully defined in the FAA-E-2679a, DOT FAA Specification Common Digitizer-2 (CD-2), 22 June 1982, and are copied into this document for reference only.

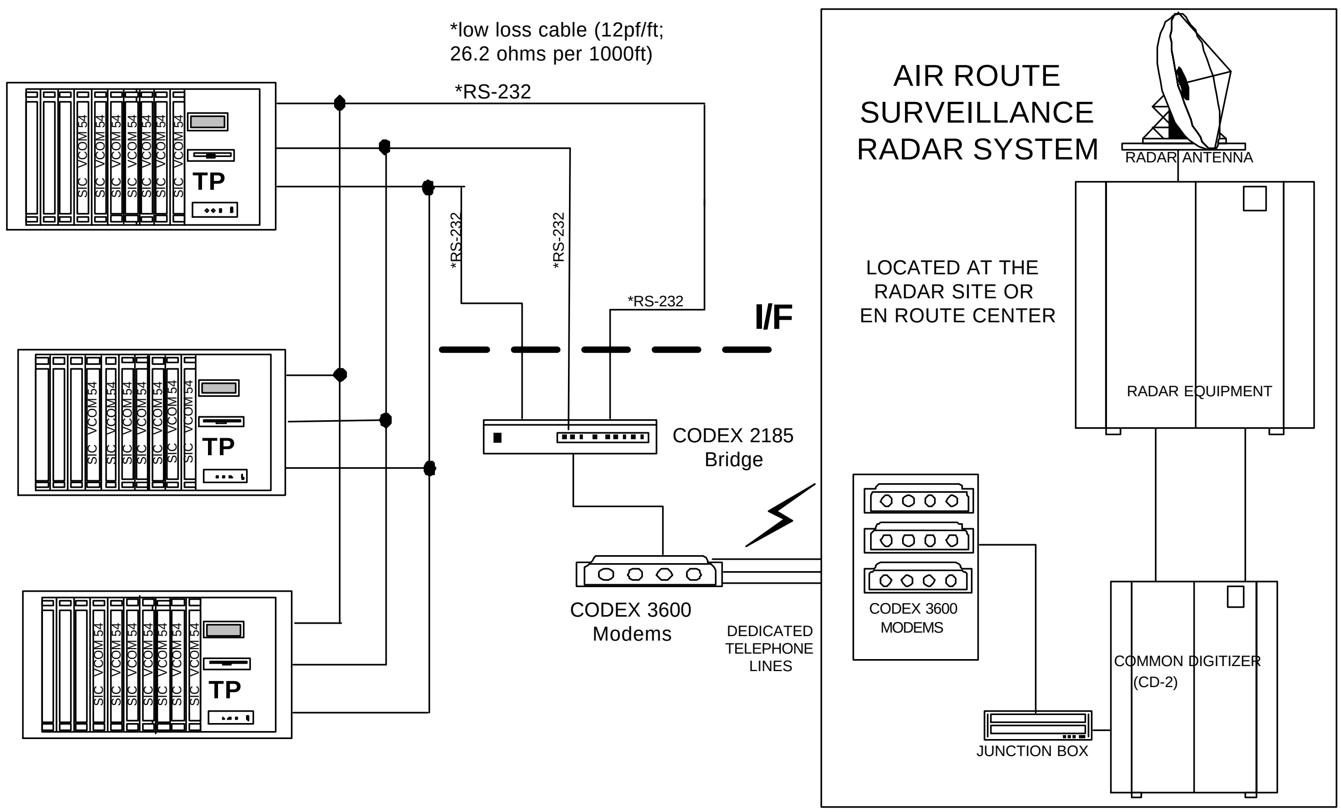


FIGURE 13-1. AIR ROUTE SURVEILLANCE RADAR INTERFACE BLOCK DIAGRAM

13.2 REFERENCED DOCUMENTS

13.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

13.2.1.1 Applicable Government Documents

Specifications

FAA-E-2679a	DOT FAA Specification for Common Digitizer-2 (CD-2), 22 June 1982
FAA-E-2217	DOT FAA Specification for Digital Data Communications System, 15 September 1965
	AMENDMENT **4** DOT FAA Specification for 2400 Bit-Per-Second Data set Equipment (Superseding Digital Data Communications System (DACOM), 30 October 1970
FAA-E-2747	New York TRACON Full Digital ARTS Display Technical Specification, 23 January 1989

Standards

None.

Other Publications

None.

13.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

EIA-RS-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Exchange

Other Publications

None.

13.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00052	ARTS IIIE Upgrade To Selected Air Traffic Control Facilities, Modification 8, 31 December 1993

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993

FAA Computer Program Functional Specifications

NAS-MD-636	Update 1 A6.05/A2.09 ARSR Input Processing, 06 November 1994

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

13.3 AIR ROUTE SURVEILLANCE RADAR INTERFACE DESCRIPTION

13.3.1 General Information

The interface to the ARTS IIIE system from the ARSRs is EIA-RS-232 via modems and dedicated telephone lines from the radar site or the En Route Center. Each radar has three modem lines over which the radar data is transmitted to the ARTS IIIE system. No data is transmitted to the radar site or En Route center from the ARTS IIIE system (one-way data transmission). The output of each radar modem is fed to a modem sharing device (bridge) to provide distribution of the radar data to each of the Track Processors.

Each ARSR interface in the ARTS IIIE is composed of a modem capable of handling three dedicated telephone lines, a modem sharing device and an Intelligent Serial Interface Controller (SIC) in the Track Processor. Each SIC is capable of interfacing with at least two ARSR systems (6 synchronous serial I/O channels).

13.3.2 Mechanical Characteristics

The physical connections for the ARSR dedicated telephones line can be found in the specific modem's technical manual. The cable connections between the modem and the modem sharing device will be found in the specific type of modems and modem sharing devices used. Table 13-1 list the serial synchronous terminations that are typical for a receive only RS-232 interfacing from an ARSR

TABLE 13-1. TYPICAL CONNECTIONS (RS-232) FOR A RECEIVE ONLY SYNCHRONOUS INTERFACE FROM AN ARSR

Modem Sharing Device PIN (DTE)	FUNCTION	Modem (J) (DEC)
1	Protective Ground (SG)	1
3	Receive Data (BB)	3
7	Signal Ground (AB)	7
17	Receive Clock (DD)	17

The physical connections between the modem sharing device and the TP equipment rack are shown in Table 13-2.

TABLE 13-2. MODEM SHARING DEVICE (BRIDGE) TO TRACK PROCESSOR (RS-232)

Modem Sharing Device PIN (DCE)	Function	Track Processor Pin (DTE)
1	Protective Ground (SG)	1
3	Receive Data (BB)	3
4	Request to Send (CA)	4
7	Signal Ground (AB)	7
17	Receive Clock (DD)	17

13.3.3 Electrical Characteristics

Signal levels of marking and spacing for data and control from the modem and modem sharing equipment are as specified in EIA-RS-232 Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange.

13.3.4 Protocol

The protocol signals between the ARTS Track Processors and the GFE modem sharing device (bridge) are based upon the ETA RS-232 serial communications interface under software control. All timing for this interface is provided by the GFE side of the interface. The functional signals used by this protocol are listed in Table 13-2 and described below.

<u>Receive Data</u>

The data signals generated by the modem in response to data channel line signals received from a remote site are transferred on this circuit to the Track Processor.

<u>Receive Clock</u>

The modem signals on this circuit provide the Track Processor with receive signal element timing information. The transition from ON to OFF indicates the center of each Receive Data signal element. Timing information is provided whenever the modem is powered on.

<u>Request To Send</u>

The Request To Send signal originates form the Track Processor and can be used to select which subchannel the CODEX 2185 bridge will activate for transmissions from the TP. The ARSR interface is receive-only, so this RTS signal is not applicable on the Codex 2185 main channel interface to all connected subchannels (i.e., TPs).

13.3.5 Data Format

The data transferred from the ARSR interface consists of six types of messages (12-bit data words not including parity). The formats of the Status, Beacon, Search RTQC, Search, Strobe Map, and Variable Map messages are shown in Tables 13-4 through 13-9. Each word of these messages has a parity bit (bit 0) that has odd parity. An idle character is transmitted when no data is available; its format is 0001111111111 (note even parity for idle character).

TABLE 13-4. CD2 STATUS MESSAGE FORMAT

12	11	10	9	8	7	6	5	4	3	2	1	¬ BIT
Test	000110000									FAA	AF	Word 1
SRC	SBC	CDA	OBA	BD	AIM	CP	SBA	ORA	OS	HPG	SO	Word 2
MTA	MIMA	BRA	SRA	RA	SD		MXRL	MNRL	ASA	NMO	SMO	Word 3
WFO	WFA	DRO	HST	HSI	BOV	CGM	*ND		DC3	DC2	DC1	Word 4

*** ND (Normal Detector) is not used by ATC.**

TABLE 13-5. CD2 BEACON MESSAGE FORMAT

12	11	10	9	8	7	6	5	4	3	2	1	¬ BIT
T E S T	1	1	M 2	M 3	M C	I D	R R	E R	R F	F A A	A F	Word 1
Range MSB = 128 NM LSB = 1/8											ST	Word 2
Azimuth MSB = 2048 ACPs LSB = 1 ACP												Word 3
Run Length or AIMS, DSC, M2X, M3X						Time in Store LSB = 1/2 sec				BRL	MTI	Word 4
Mode 3/A code 4 digits ABCD												Word 5
Mode 2 code												Word 6
MCS	Mode C Altitude MSB = 102400 LSB = 100 Ft											Word 7

Note: AIMS, DSC M2X, M3X bits will be replaced with Beacon Run Length (BRL) when the BRL is set.
Run length units are in ACPs and there is no minimum run length.

TABLE 13-6. CD2 SEARCH RTQC MESSAGE FORMAT

12	11	10	9	8	7	6	5	4	3	2	1	¬ BIT
Test	001001000									FAA	AF	Word 1
Range Fixed at 1 NM MSB = 128 NM, LSB = 1/8 NM											0	Word 2
Azimuth, MSB = 2048 ACPs, LSB = 1 ACP												Word 3
Run Length, LSB = 4 ACPs							Time in Store LSB = 1/8 sec					Word 4

TABLE 13-7. CD2 SEARCH MESSAGE FORMAT

12	11	10	9	8	7	6	5	4	3	2	1	¬ BIT
Test	001101100									FAA	AF	Word 1
Range MSB = 128 NM, LSB = 1/8 NM											0	Word 2
Azimuth, MSB = 2048 ACPs, LSB = 1 ACP												Word 3
AIMS			Run Length, LSB = 4 ACPs			Time in Store LSB = 1/4 sec					MTI	Word 4

TABLE 13-8. CD2 STROBE MAP MESSAGE FORMAT

12	11	10	9	8	7	6	5	4	3	2	1	¬ BIT
Test	0011000							Strobe	Type	FAA	AF	Word 1
Range MSB = 128 NM, LSB = 1/8 NM											0	Word 2
Azimuth, MSB = 2048 ACPs, LSB = 1 ACP												Word 3
Run Length, LSB = 4 ACPs							Time in Store LSB = 1/8 sec					Word 4

TABLE 13-9. CD2 VARIABLE MAP MESSAGE FORMAT

12	11	10	9	8	7	6	5	4	3	2	1	¬ BIT
Test	000000						Map Type			FAA	AF	Word 1
Range Start outline MSB = 128 NM LSB = 1/4 NM										0	0	Word 2
Azimuth MSB = 2048 ACPs LSB = 1 ACP												Word 3
Range Stop outline MSB = 128 NM LSB = 1/4 NM										0	0	Word 2

The following table provides a definition of the acronyms used in the above tables:

ACRONYM	DEFINITION	ACRONYM	DEFINITION
AF	Air Force Flag	M3X	Mode 3/A reply contains a bit in the X position
AIM	AIMS Alarm	MIMA	MIM alarm
AIMS	AIM Status	MNRL	Minimum run length discriminator status
ASA	Azimuth/Servo Alarm	MSB	Most significant bit
BD	Beacon Delay	MTA	Military timing alarm
BOV	Buffer Overload Alarm	MTI	Moving Target Indicator
BRA	Beacon RTQC Alarm	MXRL	Maximum run length discriminator status
BRL	Beacon Run Length	ND	Normal Detector
CDA	CD Alarm	NMO	Normal Map ON
CGM	Clutter-Gated MTI on	OBA	On-line beacon alarm
CP	Circular Polarization	ORA	On-line RBPM alarm
DC1	Data channel 1 on	OS	Output service
DC2	Data channel 2 on	RA	Range alarm
DC3	Data channel 3 on	SBA	Standby beacon alarm
DRO	Dynamic runlength on	SBC	Selected beacon channel
DSC	Discrete beacon code	SD	Sensitive Detector
FAA	FAA/CF type message	SMO	Strobe map ON
HPG	HPG alarm	SO	System overheat
HSI	Half-scan inhibit	SRA	Search RTQC alarm
HST	High speed timing	SRC	Selected radar channel
LSB	Least significant bit	WFA	Weather Fixed Map Unit (WFMU) alarm
M2X	Mode 2 reply contains a bit in the X position	WFO	WFMU ON

Section 14
DECODING DATA ACQUISITION SYSTEM

14.1 GENERAL DESCRIPTION

The analog signals to the DDAS are the external radar interfaces for ARTS IIE configuration of ARTS. These interfaces are illustrated in Figure 14-1.

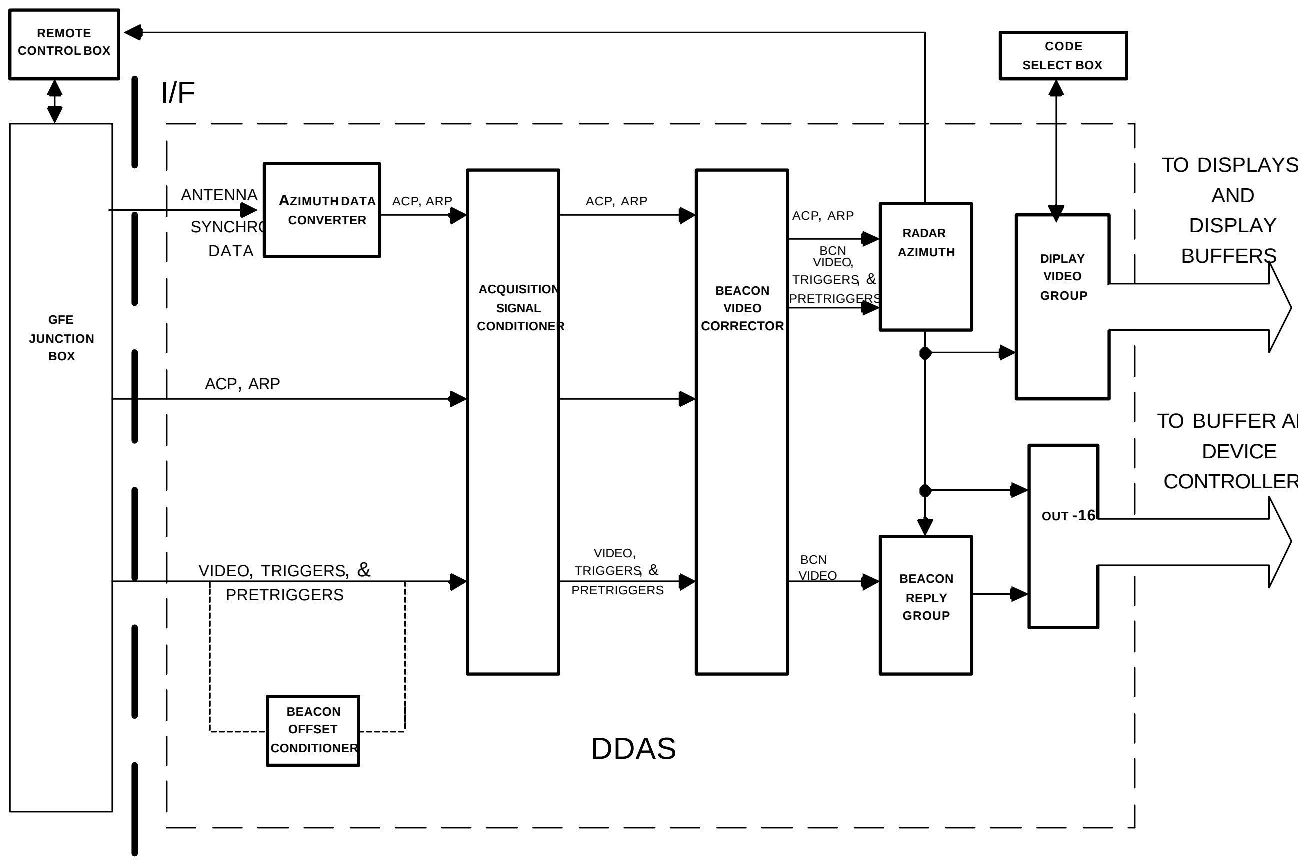


FIGURE 14-1. INTERFACE DIAGRAM FOR DDAS

14.2 REFERENCED DOCUMENTS

14.14.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

14.14.1.1 Applicable Government Documents

Specifications

FAA-E-2704	Specification for the ASR-9 Airport Surveillance Radar

FAA-TD/S-120-801A Specification for Modular Expandable ARTS III Beacon Level Tracking System

Standards

None.

Other Publications

None.

14.14.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

None.

Other Publications

ATC 61014	Hardware Top-Level Design Document (CDRL E004)
ATC 61004	System Segment Specification/Hardware Requirements Specification (CDRL E001)
ATC 61041	Hardware Detailed Design Document (CDRL E005)

14.14.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-90-C-00057 ARTS IIA Interim Support Program for Air Traffic Control Facilities

FAA Specifications

FAA-E-2570d Automated Radar Terminal Air Traffic Control System ARTS IIA (draft)

FAA Computer Program Functional Specifications

NAS-MD-638 Update 1 A6.05/A14.09 Keyboard, 06 November 1994

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

14.3 RADAR SYSTEM INTERFACE

14.3.1 General Information

The radar system interface consists of normal radar video, moving target indicator (MTI) video, beacon video, map video, a spare video input pretrigger signals, and azimuth information. The azimuth information consists of Azimuth Change Pulses (ACPs) and Azimuth Reference Pulses (ARPs).

14.3.2 Mechanical Characteristics

The Common ARTS IIE configuration external interface connectors are located at the rear of the Radar Alphanumeric Display System (RADS) console. The radar video (both normal and MTI), beacon video, map video, and pretrigger signals enter the RADS console at the rear via coaxial cable and BNC connectors. In addition, the ACPs and ARPs enter at the rear of the console via coaxial cabling and BNC connectors.

14.3.3 Electrical Characteristics

The radar system interface signal characteristics of the ACPs, ARPs, and the broadband video are specified in FAA-TD-120/S-801A and the ASR-9 specification FAA-E-2704. The ASR-9 radar interface is identical to the existing radar sensors.

14.3.3.1 Azimuth Data Inputs

The azimuth information consisting of ACPs and ARPs is fed to the Azimuth Data Converter (ADC) via the GFE Junction Box. One antenna head rotation (360°) consists of 4096 equally spaced ACPs and one ARP. The ARP is positioned to fall within 20 percent of the ACP interval from the midpoint between the 4096th ACP of one radar scan and the first ACP of the next radar scan. The electrical characteristics of ADC, ACPs, and ARPs are as follows:

1. ADC Interface

   a. Reference Voltage: 120 volts RMS 60 Hertz
   Stator Voltage: 90 volts RMS (Maximum Output)
   System Type: One-speed and 10-speed synchro transmitters
   Antenna Speed: 10 to 15 revolutions per minute (RPM)

   b. Azimuth data output (75 ohm impedance)

   Logic 0: 0 to 0.5 Vdc
   Logic 1: 5.0 ±1 Vdc
   Pulse Width: 23 ±3 microseconds
   Pulse Rise Time: 1.0 microsecond (max)
   Pulse Decay Time: 1.0 microsecond (max)
   Jitter: ACP: 10% of nominal spacing
   ARP: 10% of nominal spacing
   ACPs: 4096 pulses per 360 degrees of antenna rotation, equally spaced for
   constant rotation rate
   ARP: At antenna north position midway between two ACPs
   Source Impedance: 75 ohms (coax)

   c. Azimuth data output (600 ohm impedance)

   ACPs: 4096 pulses per 360 degrees of antenna rotation, equally spaced for

	constant rotation rate
Jitter:	ACP: 10% of nominal spacing
	ARP: 20% of nominal spacing
ARP:	One pulse of the same duration as an ACP per 360 degrees of antenna rotation
ARP Position:	At antenna north position, midway between two ACPs
Pulse Amplitude:	5.0 ±1 Vdc (ARP and ACP)
Source Impedance:	600 ohms

2. BEACON Video Interface

a. Uncompensated

Amplitude:	1 to 7 volts
Rise Time:	0.05 to 0.30 µsec(between 90% and 10% amplitude levels)
Fall Time:	0.10 to 0.35 µsec(between 90% and 10% amplitude levels)
Pulse Duration:	0.2 to 0.7 µsec (between 50% amplitude levels)

b. Compensated: 120 volts RMS, 60 Hertz

Amplitude:	1 to 4 volts (adjustable)
Rise Time:	0.05 to 0.15 µsec (between 90% and 10% amplitude levels)
Fall Time:	0.10 to 0.25 µsec (between 90% and 10% amplitude levels)
Pulse Duration:	0.35 to 0.60 µsec (between 50% amplitude levels)
Noise Level (max):	0.5 volt average peak
Overshoot:	Less than 10%
Undershoot:	Less than 10%
Polarity:	Positive
DC Level	Less than 0.005 volt

c. Beacon Reply Group (BRG)

Pulse Bracket Spacing:	20.3 ±0.2 µsec (for code and SPI data)

d. Beacon Video Conditioner (BVC)

Pulse Rejection:	Less than 250 µsec in duration
Pulse Acceptance:	Greater than 350 µsec in duration

3. Triggers and Sync Pretrigger

a. Uncompensated

Amplitude:	10 to 60 volts
Duration:	1.0 ±0.5 µsec (between 50% amplitude levels)
Rise Time:	10 to 50% duration
P1 to P3 Spacing:	8.0 ±0.5 µsec, and 21µsec ±0.5 µsec (between 50% amplitude levels)

b.. Compensated:

Amplitude:	25 to 60 volts (adjustable)
Duration:	1.0 ±0.5 µsec (between 50% amplitude levels)
Rise Time:	Less than 20% of duration
Jitter:	Less than 10%
Polarity:	Positive
Waveform:	Approximately a square pulse

14.3.3.2 Radar Inputs

Analog radar inputs (video) are as follows:

1. Radar Pretrigger

Pulse Amplitude:	4 to 85 volts (+)
Source Impedance:	91 ohms (coax)
Pulse Width:	0.5 to 14.0 msec
Pulse Rise Time:	0.01 to 0.1 msec
Pulse Fall Time:	0.01 to 0.4 msec
Pulse Repetition Frequency:	700 to 1500 pulses/second
Timing Sequence:	20 to 200 msec prior to radar trigger or radar zero range

2. Normal Video (analog)

Video Level:	0.5 to 6 volts (+)
Source Impedance:	91 ohms (coax)
Video Pulse Width: (Isolated Target)	0.5 to 1500 msec
Video Rise Time: (Isolated Target)	0.1 ±0.01 msec
Video Fall Time:	0.1 ±0.03 msec
Thermal Noise Level:	250 mV mean peak
Minimum Discernible Signal:	110 dBm (typical)

3. MTI Video (Analog)

Video Level:	0.5 to 6 volts (+)
Source Impedance	91 ohms (coax)
Video Pulse Width: (Isolated Target)	0.5 to 6.5 msec
Video Rise Time: (Isolated Target)	0.1 ±0.01 msec
Video Fall Time:	0.1 ±0.02 msec
Thermal Noise:	250 mV mean peak
Minimum Discernible Signal:	108 dBm (typical)

14.3.3.3 Beacon Inputs

Beacon inputs (video) are as follows:

Amplitude:	1V to 4V. Voltage protection shall be incorporated to prevent damage from video amplitudes as high as 50V
Rise Time:	0.05 to 0.15 msec
Fall Time:	0.10 to 0.25 msec
Pulse Width:	0.35 to 0.60 msec
Noise Level (max):	0.5V peak
Source Impedance:	91 ohms (coax)

Section 15
CENTER-TRACON AUTOMATION SYSTEM FINAL APPROACH SPACING TOOL (CTAS/FAST)

15.1 GENERAL DESCRIPTION

The Center-TRACON Automation System Final Approach Spacing Tool (CTAS/FAST) is a prototype developed by NASA and currently in use in the Dallas TRACON. CTAS/FAST interfaces to Common ARTS to provide spacing information to the controllers. Common ARTS provides a generic firewall capability to support interfaces with outside functionality through the use of an ARTS Interface Gateway Chassis (AGW). The AGW runs various processes to interface and convert messages between Common ARTS and other equipment. Center TRACON Interface Software (CTIS) is an example of one of the processes running in the AGW which acts to convert the current Common ARTS messages to an external form used by the CTAS/FAST system. The direct interface for CTAS/FAST is between the AGW and the ARTS Data Acquisition and Routing Subsystem (ADAR). ADAR is a preprocessor for CTAS/FAST on the external side of the interface.

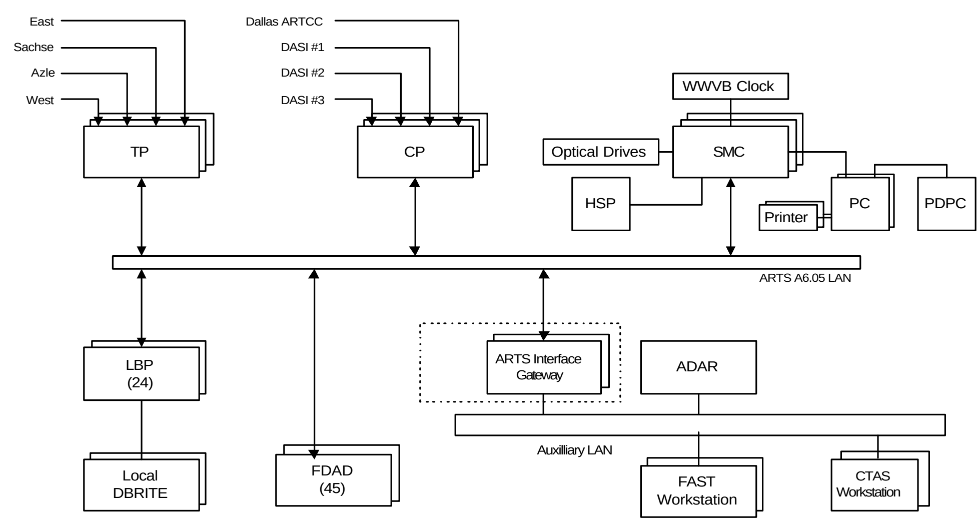


FIGURE 15-1. COMMON ARTS SYSTEM WITH CTAS

This section discusses the interface between the AGW and the ADAR.

15.2 REFERENCED DOCUMENTS

15.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

15.2.1.1 Applicable Government Documents

Specifications

ATC 60050	Interface Design Document, Final, 13 December 1995.

Standards

None.

Other Publications

None.

15.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

FIPS PUB 160	American National Standard for Information Systems - Programming Language – C
ANSI/IEEE Standard 802.3	- Institute of Electrical and Electronic Engineers-Local Area Networks International Standards Organization (ISO) Open System Interconnect (OSI) Reference Mode and ISO Communication Protocol Standards.
IETF STD-0005	Internet Protocol, September 1981
IETF STD-0007	Transmission Control Protocol, September 1981
IETF STD-0041	Standard for the transmission of IP datagrams over Ethernet networks, April 1984

Other Publications

None.

15.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-92-C-00020	TASK ORDER CF-01
DTFA01-92-C-00052	Engineering Services Task No. 50

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993.

FAA Computer Program Functional Specifications

ARTS NAS-MD-634, A6.05/A2.09	System Description and Specified Series, Final, Rev. B, May 1998
ARTS NAS-MD-638, A6.05/A2.09	Keyboard, Final, Rev. B, May 1998
ARTS NAS-MD-639, A6.05/A2.09	Display Output Processing and Converging Runway Display Aid (CRDA), Final, Rev. B, May 1998
ARTS NAS-MD-642, A6.05/A2.09	Error and Status Messages, Final, Rev. B, May 1998
ARTS NAS-MD-643, A6.05/A2.09	Site Adaptation, Final, Rev. B, May 1998
ARTS NAS-MD-646, A6.05/A2.09	CDR Editor, RETRACK and Disk/File Utilities, Final, Rev. B, May 1998
ARTS NAS-MD-648, A6.05/A2.09	Continuous Data Recording Processing and Performance Monitoring, Final, Rev. B, May 1998

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

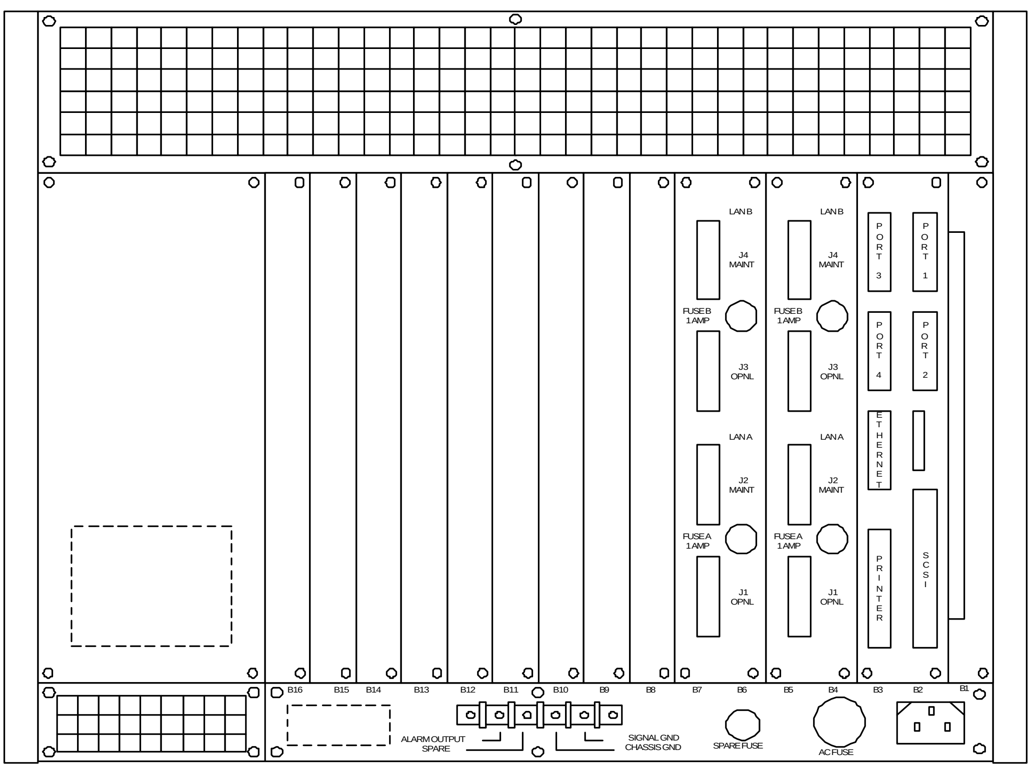
15.3 CTAS/FAST INTERFACE

15.3.1 General Information

The Common ARTS Interface to the CTAS/FAST is through a 10 megabit per second ethernet running TCP/IP protocols. The ethernet interface on the MVME-177 card in the AGW is used to communicate to the ethernet on the Sun Workstation which acts as the CTAS interface.

15.3.2 Mechanical Characteristics

The ethernet connection on the back of the chassis for slot 1 is used for this interface and connects to an Attachment Unit Interface (AUI) cable which in turn connects to the Medium Attachment Unit (MAU), also called a transceiver. The connector on the back of the ARTS gateway consists of a standard 15 pin connector suifor the transceiver of choice for this interface. Common ARTS does not specify whether this network needs to be a 10-based T, 10-based 2, or 10-based 5 thick ethernet. The AUI, MAU and ethernet is consider external to the Common ARTS system.



ARTS Interface Gateway Chassis - Back View

15.3.3 Electrical Characteristics

The 15 pin DTE interface which connects to the AUI conforms to the industry standard pin layout. The AUI cable carries three data signals between the Ethernet interface and MAU: transmit data (from the Ethernet interface to the network), receive data (from the network to the interface), and a collision presence signal (from the network to the interface). Each signal is sent over a pair of wires. Another pair of wires are used to carry 12 volt DC power from the Ethernet interface to the MAU.

15.3.4 Network Protocol

The CTAS/FAST interface to the Common ARTS system uses TCP/IP protocols. The Center TRACON Interface Software (CTIS) process running in the AGW acts as a TCP server listening on port 5030. All data is passed in network byte order (big endian). The IP address for this interface is set in Common ARTS Adaptation and is physically set by CTIS when the program initializes.

15.3.5 Data Format

The submessages each have a 2 byte submessage code and a 2 byte length followed by data specific to the submessage. The submessage length does include the length of the code and length fields thus no submessage can be less than 4 bytes long and likewise no message can be less than 4 bytes long.

Submessages from AGW to ADAR

Submessage	**Code**
ADAR Active Track Maintenance Msg	0x1310
ADAR Controller Keyboard Msg	0x1313
ADAR CP Critical Data Msg	0x1311
ADAR Delete Flight Data Msg	0x1321
ADAR Delete Track Msg	0x1315
ADAR Flight Plan Maintenance Msg	0x1316
ADAR TP Heartbeat Msg	0x1317
ADAR CTIS Heartbeat Msg	0x1312

Submessages from ADAR to AGW

Submessage	Code
ADAR Controller Kybd Resp Msg	0x1303
ADAR Heartbeat Msg	0x1304
FAST Advisory Msg	0x1305
CDR FAST Advisory Msg	0x1306
ADAR CDR Controller Kybd Msg	0x1320
ADAR ASCII Status Msg	0x1319

The detailed structure of the submessages are described in the following paragraphs. Typically, these structures are defined as C data structures which are included with the application program that processes the messages.

15.3.5.1 ADAR Active Track Maintenance Msg (m_adar_atm)

External form of Active Track Maintenance Msg (1700) The Active Track Maintenance (ATM) is sent from various CSCIs to indicate to the receiving CSCIs that track data has been updated. It contains the updated track position, speed, altitude, etc. The ATM message is most commonly sent by TPS and received by CPS (for linking and FP association), DPS (for display), and SMON (for recording). It is sent once per track per scan via the Track Sensor Multiqueue.

ATMs come in two categories: "principal" and "subordinate". Principal ATMs are sent in the normal case (as described above) for all tracks in all sensors, including ARSRs. Subordinate ATM messages are used in the special case when a Display Sensor Switch command is entered and an ARSR is selected to backup a given ASR. When this condition is present, TPS adds data to the message to provide transformed XY coordinates (relative to the specific ASR) and sends the ATM again via another multiqueue. This additional multiqueue is named appropriately to define the specific ARSR-ASR combination. The sub_sensor field distinguishes Principal ATMs from Subordinate ATMs: IF sub_sensor == NULL_SENSOR, THEN this is a Principal ATM. The fields sub_rept_pos_x, sub_rept_pos_y, and sub_rep_range only have meaning in Subordinate ATMs.

15.3.5.1.1 Destination/Source Data

msgsource	msgdest	method	frequency
CTIS	ADAR	PP	1/ Active Track Maintenance Message

15.3.5.1.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUMMSGL	1	Y
3	Predicted Altitude - Uncorrected	pre_alt	Scaled	Feet	-1000..99900	1/8	N
4	Reported Altitude - Corrected	rep_alt	Scaled	Feet	-1000..99900	1/8	N
5	Smoothed Altitude - Uncorrected	smooth_alt	Scaled	Feet	-1000..99900	1/8	N
6	Time of Last Correlation (zulu msecs)	last_coorel	Int	msec	0..86399999	1	N
7	Altitude Correction Factor	alt_correction	Int	Feet	-1900..2900	1/8	N
8	Altitude Velocity	alt_veloc	Int	Feet/Sec	-1000..1000	1/8	N
9	Track Reported X Coord	rept_pos_x	Scaled	NM	-256..256	1/128	N
10	Track Reported Y Coord	rept_pos_y	Scaled	NM	-256..256	1/128	N
11	Subordinate Track Reported X Coord	sub_rept_pos_x	Scaled	NM	-256..256	1/128	N
12	Subordinate Track Reported Y Coord	sub_rept_pos_y	Scaled	NM	-256..256	1/128	N
13	X Velocity	xdot	Scaled	NM/Sec	-0.25..0.25	1/65536	N
14	Y Velocity	ydot	Scaled	NM/Sec	-0.25..0.25	1/65536	N
15	Altitude Acceleration	alt_accel	Scaled	Ft/Sec/Sec	-160..160	1/8	N
16	Track Predicted Azimuth	azimuth	Scaled	ACP	0..4096	1/16	N
17	Track Predicted Range	range	Scaled	NM	0..256	1/256	N
18	Reported Beacon Code	rbc	Int	N/A	0..07777	1	N
19	Last Valid Reported Azimuth	rep_azimuth	Scaled	ACP	0..4096	1/16	N
20	Last Valid Reported Range	rep_range	Scaled	NM	0..256	1/256	N
21	Subordinate Reported Range	sub_rep_range	Scaled	NM	0..256	1/256	N
22	Track Reported System X Coord	rept_sys_x	Scaled	NM	0..1024	1/64	N
23	Track Reported System Y Coord	rept_sys_y	Scaled	NM	0..1024	1/64	N
24	Track Speed	speed	Scaled	NM/sec	0..0.25	1/65536	N
25	Track Number	trk_num	Int	N/A	1..TQi	1	Y
26	Pseudo Track	pseudo_trk	Boolean	N/A	0..1	N/A	N
27	Altitude Firmness	alt_firm	Int	N/A	0..17	N/A	N
28	Altitude History	alt_sld_window	Encoded	N/A	0..0377	N/A	N
29	Track Firmness Value	firmness	Int	N/A	0..39	N/A	N
30	Principal Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
31	Track Usage Status	status_ut	Enum	N/A	N/A	N/A	N
32	Subordinate Sensor Number	sub_sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
33	Track Class	tr_class	Enum	N/A	N/A	N/A	N
34	Mode 3A (RBC) Validity	va	Enum	N/A	0..3	N/A	N
35	Mode C (altitude) Validity	vc	Enum	N/A	0..3	N/A	N
36	Beacon Correlation	bcn_corl	Boolean	N/A	0..1	N/A	N
37	Deviation Trial Track	deviat	Boolean	N/A	0..1	N/A	N
38	Drop BCID Request	drop_bcid	Boolean	N/A	0..1	N/A	N
39	Emergency Indicator	em	Boolean	N/A	0..1	N/A	N
40	Initial Track Indicator	initial	Boolean	N/A	0..1	N/A	N
41	No Altitude	no_alt	Boolean	N/A	0..1	N/A	N
42	No RBC	no_rbc	Boolean	N/A	0..1	N/A	N
43	Parrot Track Indicator	parrot_trk	Boolean	N/A	0..1	N/A	N

44	Radar Correlation	rdr_corl	Boolean	N/A	0..1	N/A	N
45	Radar Only Track	rdr_only_trk	Boolean	N/A	0..1	N/A	N
46	Special Position Ident	spi	Boolean	N/A	0..1	N/A	N
47	Terminate Requested	term_req	Boolean	N/A	0..1	N/A	N
48	Training Status	tng	Boolean	N/A	0..1	N/A	N
49	Unreasonable Mode C	un_modec	Boolean	N/A	0..1	N/A	N
50	Valid Altitude	valid_alt	Boolean	N/A	0..1	N/A	N

15.3.5.1.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1310	uns16	1	31-16
2	Submessage Length	Message Length = 84 bytes	uns16	1	15-0
3	Predicted Altitude - Uncorrected		int32	2	31-0
4	Reported Altitude - Corrected		int32	3	31-0
5	Smoothed Altitude - Uncorrected		int32	4	31-0
6	Time of Last Correlation (zulu msecs)		uns32	5	31-0
7	Altitude Correction Factor		int16	6	31-16
8	Altitude Velocity		int16	6	15-0
9	Track Reported X Coord		int16	7	31-16
10	Track Reported Y Coord		int16	7	15-0
11	Subordinate Track Reported X Coord		int16	8	31-16
12	Subordinate Track Reported Y Coord		int16	8	15-0
13	X Velocity		int16	9	31-16
14	Y Velocity		int16	9	15-0
15	Altitude Acceleration		int16	10	31-16
16	Track Predicted Azimuth		uns16	10	15-0
17	Track Predicted Range	DPS Checks 0..90.5	uns16	11	31-16
18	Reported Beacon Code		uns16	11	15-0
19	Last Valid Reported Azimuth		uns16	12	31-16
20	Last Valid Reported Range		uns16	12	15-0
21	Subordinate Reported Range		uns16	13	31-16
22	Track Reported System X Coord		uns16	13	15-0
23	Track Reported System Y Coord		uns16	14	31-16
24	Track Speed		uns16	14	15-0
25	Track Number		uns16	15	31-16
26	Pseudo Track		uns16	15	15-0
27	Altitude Firmness		uns8	16	31-24
28	Altitude History		uns8	16	23-16
29	Track Firmness Value		uns8	16	15-8
30	Principal Sensor Number		uns8	16	7-0
31	Track Usage Status	ASSOCIATED(1)=associated UNASSOCIATED(3)=unassociated	uns8	17	31-24
32	Subordinate Sensor Number		uns8	17	23-16
33	Track Class	NORMAL_TRACK(0)=Normal PARENT_TRACK(1)=Parent TRIAL_TRACK(2)=Parent Trial TENTATIVE_TRACK(3)=Tentative	uns8	17	15-8

34	Mode 3A (RBC) Validity	NOTVALID(0)=Invalid GARBLED(1)=Garbled VALID_MODE3A(2)=Report Mode 3A Check VALID(3)=Valid	uns8	17	7-0
35	Mode C (altitude) Validity	NOTVALID(0)=Invalid GARBLED(1)=Garbled VALID_MODEC(2)=Reported Mode C Check VALID(3)=Valid	uns8	18	31-24
36	Beacon Correlation		boolean	18	23-16
37	Deviation Trial Track		boolean	18	15-8
38	Drop BCID Request		boolean	18	7-0
39	Emergency Indicator		boolean	19	31-24
40	Initial Track Indicator		boolean	19	23-16
41	No Altitude		boolean	19	15-8
42	No RBC		boolean	19	7-0
43	Parrot Track Indicator		boolean	20	31-24
44	Radar Correlation		boolean	20	23-16
45	Radar Only Track		boolean	20	15-8
46	Special Position Ident		boolean	20	7-0
47	Terminate Requested		boolean	21	31-24
48	Training Status		boolean	21	23-16
49	Unreasonable Mode C		boolean	21	15-8
50	Valid Altitude		boolean	21	7-0

15.3.5.2 ADAR ASCII Status Msg (m_adar_ascii_status)

External form of the ASCII Status Msg (0002) This submessage contains ASCII text for display and printing at the SMC. The message class field allows filtering of printouts. The possible message classes are:

RECORDCLASS	1	Recording Class
ALARMCLASS	2	Alarm (Beep) Class
CONFIGCLASS	3	Configuration Class
SENSORCLASS	4	SRAP Class
RESPCLASS	5	Response Class
RTQCCLASS	6	RTQC Class
FORCEDCLASS	7	No Filter Class
DEBUGCLASS	8	Debug Class
OPERCLASS	9	Operational Class
HSPCLASS	10	HSP printer only Class
SBLASTCLASS	11	Alarm (Sound Blaster) Class
CDRCLASS	12	CDR Message Class
TRAFCLASS	13	Automated Traffic Count Class

Text is null terminated.

15.3.5.2.1 Destination/Source Data

msgsource	msgdest	method	frequency
ADAR	CTIS	PP	1/Debug Printout

15.3.5.2.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	bytes	4..MAXSUBMSGL	1	Y
3	Instance of the target	instance	Int	N/A	N/A	N/A	N
4	Highlight Message Indicator	af	Boolean	N/A	0..1	N/A	N
5	ASCII Status Msg Class	msg_class	Enum	N/A	0..13	N/A	N
6	Target name linked to build ID	build_name[[16] =1]	ASCII	N/A	N/A	N/A	N
7	Target name linked to build ID	build_name[[16] = 16]	ASCII	N/A	N/A	N/A	N
8	ASCII Status Text	text[[MAXSUB MSGL - 26]=1]	ASCII	N/A	N/A	N/A	N
9	ASCII Status Text	text[[MAXSUB MSGL - 26]= 1426]	ASCII	N/A	N/A	N/A	N

15.3.5.2.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1319	uns16	1	31-16
2	Submessage length	Message Length = 1452 bytes	uns16	1	15-0
3	Instance of the target		int32	2	31-0
4	Highlight Message Indicator		boolean	3	31-24
5	ASCII Status Msg Class	See text	uns8	3	23-16
6	Target name linked to build ID		char	3	15-8
7	Target name linked to build ID		char	7	23-16
8	ASCII Status Text	Text length is max	char	7	15-8
9	ASCII Status Text	Text length is max	char	363	7-0

15.3.5.3 ADAR CDR Controller Kybd Msg (m_adar_cdr_kybd)

This submessage is used for CDR extraction of all keyboard entries processed by ADAR. Data extracted includes system time, sensor number, controller identification, function number, an implied function indicator, a live/training track indicator, ACID (if present), trackball slew coordinates, preview area characters, and a keyboard entry error number.

The possible error responses are:

FORMAT	1	FORMAT
CAPACITY	2	CAPACITY
NO_SLEW	3	NO SLEW
ILL_TRK	4	ILL TRK
ILL_POS	5	ILL POS
ILL_LINE	6	ILL LINE
ILL_FNCT	7	ILL FNCT
IF_WAIT	8	IF WAIT
DUP_BCN	9	DUP BCN
DUP_ID	10	DUP ID
IF_INHIB	11	IF INHIB
WWVB_DOWN	12	WWVB DOWN
FUNCT_ERR	13	FUNCT ERR
NOT_ON_DC	14	NOT ON DC
CP_DOWN	15	CP DOWN
TP_DOWN	16	TP DOWN
OPRND_ERR	17	OPRND ERR
ILL_REQ	18	ILL REQ
NOT_ADAPTED	19	NOT ADAPTED
NO_RESP	20	NO RESP
UNEXPTD_RESP	21	UNEXPTD RESP
INPUT_INHIBITED	22	INPUT INHIBITED

The defined function numbers are:

1	Track Start
2	Track Reposition
3	Track Suspend
4	Track Drop
5	Track Handoff
6	Flight Data
7	Multi Function
9	VFR Flight Plan
10	Interfacility Print
11	Conflict Alert
12	Special Activity
13	Run Down List
14	IF Test

15 Target Generator
20 System Entry

15.3.5.3.1 Destination/Source Data

msgsource	msgdest	method	frequency
ADAR	CTIS	PP	1/Controller Keyboard Message processed by ADAR

15.3.5.3.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	bytes	0..MAXSUBMSGL	1	Y
3	Current Zulu Time	time	Seconds	N/A	0..24*60*60	1/1000	N
4	Node ID Where Entry Made	src_nid	Int	N/A	1..MAX_NUM_NIDS - 1	N/A	N
5	Display Number Where Entry Made	disp_num	Int	N/A	1..MAX_NUMDQ	N/A	N
6	Trackball X-Coordinate	tb_x	Scaled	N/A	-64..64	1/16	N
7	Trackball Y-Coordinate	tb_y	Scaled	N/A	-64..64	1/16	N
8	Trackball Entered Indicator	tb_ent	Boolean	N/A	0..1	N/A	N
9	Sensor Number	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	N/A	N
10	FDB symbol	kybd_symbol	ASCII	N/A	Alphanumeric	N	N
11	Keyboard Subset	kybd_subset	Int	N/A	1..7	N/A	N
12	Function Number	func_nbr	Enum	N/A	0..20	N/A	N
13	Implied Function Indicator	implied	Boolean	N/A	0..1	N/A	N
14	ACID Present Indicator	acid_present	Boolean	N/A	0..1	N/A	N
15	Live Track Indicator	live	Boolean	N/A	0..1	N/A	N
16	PC ID	pc_id	Int	N/A	1..6	N/A	N
17	Source of Entry	se	Enum	N/A	0..1	N/A	N
18	Aircraft ID	acid[[7]=1]	ASCII	N/A	Alphanumeric	N/A	N
19	Aircraft ID	acid[[7]= 7]	ASCII	N/A	Alphanumeric	N/A	N
20	Error Number	error_nbr	Enum	N/A	0..19	N/A	N
21	Keyboard characters	chars[[PREV_CHARS + 1]=1]	ASCII	N/A	ASCII	N/A	N
22	Keyboard characters	chars[[PREV_CHARS + 1]= 46]	ASCII	N/A	ASCII	N/A	N
23	pad byte	unused1	N/A	N/A	N/A	N/A	N
24	pad byte	unused2	N/A	N/A	N/A	N/A	N

15.3.5.3.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1320	uns16	1	31-16
2	Submessage length	Message Length = 84 bytes	uns16	1	15-0
3	Current Zulu Time		uns32	2	31-0
4	Node ID Where Entry Made		uns32	3	31-0
5	Display Number Where Entry Made		uns16	4	31-16
6	Trackball X-Coordinate		int16	4	15-0
7	Trackball Y-Coordinate		int16	5	31-16
8	Trackball Entered Indicator		boolean	5	15-8
9	Sensor Number		uns8	5	7-0
10	FDB symbol	associated with this kybd	uns8	6	31-24
11	Keyboard Subset		uns8	6	23-16
12	Function Number	See text	uns8	6	15-8
13	Implied Function Indicator		boolean	6	7-0
14	ACID Present Indicator		boolean	7	31-24
15	Live Track Indicator		boolean	7	23-16
16	PC ID	(1-6)	uns8	7	15-8
17	Source of Entry	(0=DP1=SMC)	uns8	7	7-0
18	Aircraft ID		uns8	8	31-24
19	Aircraft ID		uns8	9	15-8
20	Error Number	See text	uns8	9	7-0
21	Keyboard characters		char	10	31-24
22	Keyboard characters		char	21	23-16
23	pad byte		uns8	21	15-8
24	pad byte		uns8	21	7-0

15.3.5.4 ADAR Controller Keyboard Msg (m_adar_kybd)

External form of the Controller Keyboard Msg (0004) This submessage can originate from a display keyboard, SMON PC keyboard, an ETG scenario, or a Replay/RETRACK command. The Controller Keyboard message contains all the data associated with a controller entry (i.e., keyboard number, function, trackball positions, and keyboard characters). In addition, the submessage may specify a track to which the keyboard entry pertains. The track may be inactive (i.e., reside in the CP CTS) or active. If no track is specified, the track number field equals zero. The source of entry indicates where the entry originated: a display or SMC-PC. The Display number is not used (0) when the entry originates from a SMC-PC. The PC ID and PC Line Number are zero when the message is introduced to the system via Scenario, Replay or Retrack.

The preview character count is contained in the Number of Preview Characters (nbr_char) field. A NULL terminator is always present following the last preview character. However, the NULL terminator is not included in the Number of Preview Characters (nbr_char) count.

The function number (func_nbr) maximum value varies depending on which CSCI is receiving the message. SMON can expect to receive a value of no larger than 20 (SMFUNC); while the other CSCI's receiving this message can expect to receive a value of no larger than 16 (MAX_FUNCT).

15.3.5.4.1 Destination/Source Data

msgsource	msgdest	method	frequency
CTIS	ADAR	PP	1/ F16 Controller Keyboard entry

15.3.5.4.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Identification	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUBMSGL	1	Y
3	Node ID Where Entry Made	src_nid	Int	N/A	1..MAX_NUM_NIDS-1	N/A	N
4	Display Number Where Entry Made	disp_num	Int	N/A	1..MAX_NUMDQ	N/A	N
5	First Trackball X-Coordinate	tb1_x	Scaled	NM	-64..64	1/16	N
6	First Trackball Y-Coordinate	tb1_y	Scaled	NM	-64..64	1/16	N
7	Second Trackball X-Coordinate	tb2_x	Scaled	NM	-64..64	1/16	N
8	Second Trackball Y-Coordinate	tb2_y	Scaled	NM	-64..64	1/16	N
9	PC Line Number	pc_line	Int	N/A	0..999	N/A	N
10	Track Number	trk_nbr	Int	N/A	0..TQi	N/A	Y
11	Function Number	func_nbr	Int	N/A	0..see text	N/A	Y
12	FDB Symbol Associated with Keyboard	kybd_symbol	ASCII	N/A	Alphanumeric	N/A	N
13	Keyboard Subset	kybd_subset	Int	N/A	1..7	N/A	N
14	Keyboard Number	kybd_nbr	Int	N/A	0..(NUMKQ+1)	N/A	Y
15	Number of Preview Characters	nbr_char	Int	N/A	0..PREV_CHARS	N/A	Y
16	PC ID	pc_id	Int	N/A	0..6	N/A	N
17	Source of Entry	se	Enum	N/A	0..1	1	N
18	Sensor Number	sensor_nbr	Int	N/A	0..(MAX_SENSQ-1)	N/A	Y
19	Character Position of First Trackball	tball_period	Int	N/A	0..PREV_CHARS	N/A	Y
20	Modify Multifunction (F7 M) Result of	md	Boolean	N/A	0..1	N/A	N
21	Multiple Function Mode Indicator	mf	Boolean	N/A	0..1	N/A	N
22	Scenario Entry	scenario	Boolean	N/A	0..1	N/A	N
23	Trackball 1 Entered Indicator	tb1_ent	Boolean	N/A	0..1	N/A	N
24	Trackball 2 Entered Indicator	tb2_ent	Boolean	N/A	0..1	N/A	N
25	Display is Training Position	training	Boolean	N/A	0..1	N/A	N
26	Track Number is in CP FDF	trk_fdf	Boolean	N/A	0..1	N/A	N
27	Keyboard Characters	chars[[PREV_CHARS + 1]=1]	ASCII	N/A	N/A	N/A	N
28	Keyboard Characters	chars[[PREV_CHARS + 1]= 46]	ASCII	N/A	N/A	N/A	N

15.3.5.4.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Identification	Message Code = 1313	uns16	1	31-16
2	Submessage Length	Message Length = 84 bytes	uns16	1	15-0
3	Node ID Where Entry Made		uns32	2	31-0
4	Display Number Where Entry Made		uns16	3	31-16
5	First Trackball X-Coordinate		int16	3	15-0
6	First Trackball Y-Coordinate		int16	4	31-16
7	Second Trackball X-Coordinate		int16	4	15-0
8	Second Trackball Y-Coordinate		int16	5	31-16
9	PC Line Number		uns16	5	15-0
10	Track Number		uns16	6	31-16
11	Function Number		uns8	6	15-8
12	FDB Symbol Associated with Keyboard		uns8	6	7-0
13	Keyboard Subset		uns8	7	31-24
14	Keyboard Number		uns8	7	23-16
15	Number of Preview Characters		uns8	7	15-8
16	PC ID		uns8	7	7-0
17	Source of Entry	(0 = DP1 = SMON)	uns8	8	31-24
18	Sensor Number		uns8	8	23-16
19	Character Position of First Trackball	Period	uns8	8	15-8
20	Modify Multifunction (F7 M) Result of	Display Multifunction (F7 D) Flag	boolean	8	7-0
21	Multiple Function Mode Indicator		boolean	9	31-24
22	Scenario Entry		boolean	9	23-16
23	Trackball 1 Entered Indicator		boolean	9	15-8
24	Trackball 2 Entered Indicator		boolean	9	7-0
25	Display is Training Position		boolean	10	31-24
26	Track Number is in CP FDF		boolean	10	23-16
27	Keyboard Characters		char	10	15-8
28	Keyboard Characters		char	21	7-0

15.3.5.5 ADAR Controller Kybd Resp Msg (m_adar_kybd_resp)

This submessage is sent by ADAR in response to a Controller Keyboard submessage. It contains a response indicating the results of the entry processing and readout or preview characters, if appropriate. It also contains the source nid and display number where the entry originated.

The possible error responses are:

OK	0	OK
CAPACITY	2	CAPACITY
NO_SLEW	3	NO SLEW
ILL_TRK	4	ILL TRK
ILL_POS	5	ILL POS
ILL_LINE	6	ILL LINE
ILL_FNCT	7	ILL FNCT
IF_WAIT	8	IF WAIT
DUP_BCN	9	DUP BCN
DUP_ID	10	DUP ID
IF_INHIB	11	IF INHIB
WWVB_DOWN	12	WWVB DOWN
FUNCT_ERR	13	FUNCT ERR
NOT_ON_DC	14	NOT ON DC
CP_DOWN	15	CP DOWN
TP_DOWN	16	TP DOWN
OPRND_ERR	17	OPRND ERR
ILL_REQ	18	ILL REQ
NOT_ADAPTED	19	NOT ADAPTED
NO_RESP	20	NO RESP
UNEXPTD_RESP	21	UNEXPTD RESP
INPUT_INHIBITED	22	INPUT INHIBITED

The preview character count is contained in the Number of Characters (nbr_char) field. A NULL terminator is always present following the last preview/readout character. However, the NULL terminator is not included in the Number of Characters (nbr_char) count.

15.3.5.5.1 Destination/Source Data

msgsource	msgdest	method	frequency
ADAR	CTIS	PP	1/Keyboard Entry

15.3.5.5.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Controller Keyboard Response code	code	Int	code	0..xFFFF	N/A	Y
2	Controller Keyboard Response length	lgth	Int	bytes	MKYBDRESPL	1	Y
3	Node ID Where Entry Made	src_nid	Int	N/A	1..MAX_NUM_NIDS-1	N/A	N
4	Display Number Where Entry Made	disp_num	Int	N/A	1..MAX_NUMDQ	N/A	N
5	PC line number	pc_line	Int	N/A	1..999	1	N
6	PC ID	pc_id	Int	N/A	1..6	1	N
7	Error number	error_nbr	Enum	N/A	0..22	N/A	N
8	Function number	func_nbr	Int	N/A	0..20	N/A	Y
9	Number of characters	nbr_char	Int	bytes	0..PREV_CHAR	1	N
10	Source of entry	se	Int	N/A	0..1	N/A	N
11	Readout type	readout_type	Enum	N/A	0..4	N/A	N
12	Keyboard number	kybd_nbr	Int	N/A	1..NUMKQ+1	N/A	Y
13	Preview/Readout chars	chars[[PREV_CHARS + 1]=1]	ASCII	N/A	N/A	N/A	N
14	Preview/Readout chars	chars[[PREV_CHARS + 1]= 46]	ASCII	N/A	N/A	N/A	N
15	Multiple function mode indicator	mf	Boolean	N/A	0..1	N/A	N
16	Multifunction Modify F7M or F7D flg	md	Boolean	N/A	0..1	N/A	N
17	Pad	unused	N/A	N/A	N/A	N/A	N

15.3.5.5.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Controller Keyboard Response code	Message Code = 1303	uns16	1	31-16
2	Controller Keyboard Response length	Message Length = 68 bytes	uns16	1	15-0
3	Node ID Where Entry Made		uns32	2	31-0
4	Display Number Where Entry Made		uns16	3	31-16
5	PC line number	(1-999)	uns16	3	15-0
6	PC ID	(1-6)	uns8	4	31-24
7	Error number	See text	uns8	4	23-16
8	Function number		uns8	4	15-8
9	Number of characters		uns8	4	7-0
10	Source of entry	(0=DP1=SMC)	uns8	5	31-24
11	Readout type	NO_READOUT(0)=No ERROR_READOUT(1)=Error TRACK_DATA(2)=Track INFO_DATA(3)=Informational SCROLL_DATA(4)=Scrollable	uns8	5	23-16
12	Keyboard number		uns8	5	15-8
13	Preview/Readout chars		char	5	7-0
14	Preview/Readout chars		char	17	31-24
15	Multiple function mode indicator		boolean	17	23-16
16	Multifunction Modify F7M or F7D flg		boolean	17	15-8
17	Pad	End of msg pad	uns8	17	7-0

15.3.5.6 ADAR CP Critical Data Msg (m_adar_cp_crit)

External form of the CP Critical Data Msg (1817) This submessage is sent from the CRIT function of the active CP to the standby CP once each scan during the normal CRIT processing. The critical data provided in this submessage is information not available in any other network messages

15.3.5.6.1 Destination/Source Data

msgsource	msgdest	method	frequency
CTIS	ADAR	PP	1/CP Critical Data Message

15.3.5.6.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	bytes	4..MAXSUBMSGL	1	Y
3	time between interval printouts	out_int_tim	Int	min	1..1439	1	N
4	req interval count for MAX print	max_int_cnt	Int	N/A	0..9	1	N
5	report enabled (TRUE = enabled)	en	Boolean	N/A	0..1	N/A	N
6	max processing selection flag	max_proc_flg	Enum	N/A	0..2	1	N
7	collection criteria (SUM Report)	cc	Enum	N/A	0..4	1	N
8	System Init or Keyboard trigger	trig	Boolean	N/A	0..1	1	N
9	time between interval printouts	out_int_tim	Int	min	1..1439	1	N
10	req interval count for MAX print	max_int_cnt	Int	N/A	0..9	1	N
11	report enabled (TRUE = enabled)	en	Boolean	N/A	0..1	N/A	N
12	max processing selection flag	max_proc_flg	Enum	N/A	0..2	1	N
13	collection criteria (SUM Report)	cc	Enum	N/A	0..4	1	N
14	System Init or Keyboard trigger	trig	Boolean	N/A	0..1	1	N
15	Current configuration number	cfg_nbr[[26]=1]	Int	N/A	1..NOCFGQ	N/A	N
16	Current configuration number	cfg_nbr[[26]= 26]	Int	N/A	1..NOCFGQ	N/A	N
17	Selected configuration CID	sel_cid[[MAX_CFG_ITM]=1]	Int	N/A	1..MAX_NUMKQ	N/A	N
18	Selected configuration CID	sel_cid[[MAX_CFG_ITM]= 1200]	Int	N/A	1..MAX_NUMKQ	N/A	N
19	DP Perf Monitor Frequency	ck_pmfreq	Int	min	1..99	1	N
20	DP Perf Data Collect Interval	ck_pmcollect	Int	sec	1..99	1	N
21	DP Perf Monitor On Off	ck_pmonoff	Int	N/A	0..MAX_NUMDQ	1	N
22	Pad	unused	N/A	N/A	N/A	N/A	N

15.3.5.6.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1311	uns16	1	31-16
2	Submessage length	Message Length = 1274 bytes	uns16	1	15-0
3	time between interval printouts	These [Fields = 6] are repeated [[4] =1] times	uns32	2	31-0
4	req interval count for MAX print		uns16	3	31-16
5	report enabled (TRUE = enabled)		uns8	3	15-8
6	max processing selection flag	CIP_CTS(0)=track store CIP_CPU(1)=CPU CIP_COR(2)=coordinates	uns8	3	7-0
7	collection criteria (SUM Report)	1 = SUM by peak association 2 = SUM by peak ADF useage 3 = SUM by peak FDF useage 4 = SUM by peak unassoc tracks 5 = SUM by peak CPU util 6 = SUM One shot	uns8	4	31-24
8	System Init or Keyboard trigger		uns8	4	23-16
9	time between interval printouts	These [Fields = 6] are repeated [[4] = 4] times	uns32	10	31-0
10	req interval count for MAX print		uns16	10	15-0
11	report enabled (TRUE = enabled)		uns8	11	31-24
12	max processing selection flag	CIP_CTS(0)=track store CIP_CPU(1)=CPU CIP_COR(2)=coordinates	uns8	11	23-16
13	collection criteria (SUM Report)	1 = SUM by peak association 2 = SUM by peak ADF useage 3 = SUM by peak FDF useage 4 = SUM by peak unassoc tracks 5 = SUM by peak CPU util 6 = SUM One shot	uns8	11	15-8
14	System Init or Keyboard trigger		uns8	11	7-0
15	Current configuration number	for each of 26 operating sectors	uns8	12	31-24
16	Current configuration number	for each of 26 operating sectors	uns8	18	23-16
17	Selected configuration CID		uns8	18	15-8
18	Selected configuration CID		uns8	318	23-16
19	DP Perf Monitor Frequency		uns8	318	15-8
20	DP Perf Data Collect Interval		uns8	318	7-0
21	DP Perf Monitor On Off		uns8	319	31-24
22	Pad	End of msg pad	uns8	319	23-16

15.3.5.7 ADAR CTIS Heartbeat Msg (m_adar_ctis_hbeat)

External form of the CTIS Heartbeat Msg (1301) This submessage is sent by the CTAS Interface (CTIS) CSCI once per second. It contains the current status of the interface to the FAST system. The CPS will process the message to detect when the FAST function is enabled. Once the FAST function is enabled, the CPS will accept and process FAST runway assignment data into the scratchpad field of those FPM messages associated with the arrival aircraft.

The CTIS State contains one of the following values:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

15.3.5.7.1 Destination/Source Data

msgsource	msgdest	method	frequency
CTIS	ADAR	PP	1/CTIS Heartbeat

15.3.5.7.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	Training Status (1-training 0-ops)	trng_status	Boolean	N/A	0..1	N/A	N
4	FAST Enabled (1-enabled)	fast_enable	Boolean	N/A	0..1	N/A	N
5	FAST Availability (1-available)	fast_avail	Boolean	N/A	0..1	N/A	N
6	CTIS State (see text)	ctis_state	Enum	N/A	0..3	N/A	N
7	Hard Disk Status	hd_stat[[2]=1]	Enum	N/A	0..1	N/A	N
8	Hard Disk Status	hd_stat[[2]= 2]	Enum	N/A	0..1	N/A	N
9	Floppy Disk Status	fd_stat	Enum	N/A	0..1	N/A	N
10	Pad msg to multiple of 32 bits	pad[[1]=1]	char	N/A	N/A	N/A	N
11	Pad msg to multiple of 32 bits	pad[[1]= 1]	char	N/A	N/A	N/A	N

15.3.5.7.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1312	uns16	1	31-16
2	Submessage length	Message Length = 12 bytes	uns16	1	15-0
3	Training Status (1-training 0-ops)		uns8	2	31-24
4	FAST Enabled (1-enabled)		uns8	2	23-16
5	FAST Availability (1-available)		uns8	2	15-8
6	CTIS State (see text)		uns8	2	7-0
7	Hard Disk Status	(1=disabled)	uns8	3	31-24
8	Hard Disk Status	(1=disabled)	uns8	3	23-16
9	Floppy Disk Status	(1=disabled)	uns8	3	15-8
10	Pad msg to multiple of 32 bits		uns8	3	7-0
11	Pad msg to multiple of 32 bits		uns8	3	7-0

15.3.5.8 ADAR Delete Track Msg (m_adar_dtm)

External form of the Delete Track Msg (1704) This message is sent whenever the TPS sets a track slot to unused. The Delete Track Msg is used to inform the DP and CP to set the corresponding track slot to unused status. This submessage is recorded by CDR when either the TA or TU extraction class is enabled.

15.3.5.8.1 Destination/Source Data

msgsource	msgdest	method	frequency
CTIS	ADAR	PP	1/Delete Track Message

15.3.5.8.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUBMSGL	1	Y
3	Track Number	trk_num	Int	N/A	1..TQi	1	Y
4	Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
5	Subordinate Sensor Number	sub_sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y

15.3.5.8.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1315	uns16	1	31-16
2	Submessage Length	Message Length = 8 bytes	uns16	1	15-0
3	Track Number		uns16	2	31-16
4	Sensor Number		uns8	2	15-8
5	Subordinate Sensor Number		uns8	2	7-0

15.3.5.9 ADAR Flight Plan Maintenance Msg (m_adar_afpm)

External Form of the Flight Plan Maintenance Msg (1800) This submessage is sent for each active associated track. It contains the current flight plan information. This submessage is transmitted each scan to permit initialization of any display within one scan. This submessage is recorded by CDR when the TA extraction class is enabled.

The Interfacility Message Types for a flight plan are as follows:

CF_NOSTATUS	0	No Interfacility Status
CF_DA	1	DA
CF_DX	2	DX
CF_DR	3	DR
CF_DT	4	DT
CF_TR	5	TR
CF_TB	6	TB
CF_DM	7	DM
CF_TU	8	TU
CF_TI	9	TI
CF_TA	10	TA
CF_FP	11	FP
CF_AM	12	AM
CF_CX	13	CX
CF_TL	14	TL
CF_TM	15	TM
CF_TN	16	TN
CF_RF	17	RF
CF_TS	18	TS
CF_TP	19	TP
CF_TZ	20	TZ
CF_VFRFP	21	VFR FP
CF_ARSAFP	22	ARSA FP
CF_MIDTU	23	Middle TU
CF_ENDTU	24	End TU
CF_EXPFP	25	Expect FP
CF_EXPTU	26	Expect TU

15.3.5.9.1 Destination/Source Data

msgsource	msgdest	method	frequency
CTIS	ADAR	PP	1/Flight Plan Maintenance Message

15.3.5.9.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check

1	Flight Plan Maintenance Msg code	code	Int	code	0..xFFFF	N/A	Y
2	Flight Plan Maintenance Msg length	lgth	Int	bytes	MAFPML	1	Y
3	Assigned beacon code	abc	Int	N/A	0..07777	N/A	N
4	Active controller	act_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y
5	Auto-handoff altitude	aho_alt	Int	feet	0..995	100 ft.	N
6	Track requested altitude	alt_req	Int	feet	-99..999	100 ft.	N
7	Flight Plan assigned altitude	asg_alt	Int	feet	0..999	100 ft.	N
8	ETA/PTD in minutes since midnight	eta_ptd	Int	minutes	0..60*24-1	1	N
9	FDF Number	fdf_num	Int	N/A	1..MAX_FDFQ	N/A	N
10	Directed Handoff controller	ho_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
11	IF message number	if_msgno	Int	N/A	1..999	N/A	N
12	IF message time delta	if_msgtime_delta	Int	seconds	0..65535	1	N
13	IF TU time delta	if_tutime_delta	Int	seconds	0..65535	1	N
14	Old Primary Controller	old_pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
15	Primary controller	pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y
16	Run Down List	rund	Int	N/A	0..MAX_NUMKQ	N/A	N
17	Satellite List Azimuth	sat_list_azimuth	Int	degrees	0..359	1	N
18	Satellite List Range	sat_list_range	Int	NM	0..64	1	N
19	TCID	tcid	Int	N/A	1..999	N/A	N
20	TI/TA beacon code	tita_bcn	Int	N/A	0..07777	N/A	N
21	Track number (per sensor)	track_nbr[[MAX_SENSQ]=1]	Int	N/A	0..TQi	N/A	N
22	Track number (per sensor)	track_nbr[[MAX_SENSQ]= 15]	Int	N/A	0..TQi	N/A	N
23	Sensor link/no link indicator	link	Boolean	N/A	0..1	N/A	N
24	Sensor real/pseudo link indicator	pseudo	Boolean	N/A	0..1	N/A	N
25	Sensor link/no link indicator	link	Boolean	N/A	0..1	N/A	N
26	Sensor real/pseudo link indicator	pseudo	Boolean	N/A	0..1	N/A	N
27	Assigned beacon code status	abc_stat	Enum	N/A	0..2	N/A	N
28	ACID number of non-space chars	acid_non_space	Int	N/A	2..7	N/A	N
29	Aircraft category	ac_cat	ASCII	N/A	H/T/B/F/L	N/A	N
30	Original Aircraft category	orig_ac_cat	ASCII	N/A	H/T/B/F/L/V/U/W	N/A	N
31	Arrival/Departure/Enroute status	ade_stat	Enum	N/A	0..255	N/A	Y
32	Auto-handoff index	aho_ind	Int	N/A	-1..127	N/A	N
33	Adjacent ARTS ID	arts_id	Int	N/A	0..MAX_NO_FACIL	N/A	N
34	Aircraft type disp counter	atcc	Int	scans	0..7	1	N
35	BRITE List Nr by Geo Area	brite_list_nbr[[MAX_GEO_BRITE]=1]	Int	N/A	0..MAX_BRT_LIST	1	N

36	BRITE List Nr by Geo Area	brite_list_nbr[[MAX_GEO_BRITE]= 8]	Int	N/A	0..MAX_BRT_LIST	1	N
37	Flight plan adaptor number	fpa	Int	N/A	0..3	1	N
38	FP status controlled VFR flight	fpstatus	Enum	N/A	0..2	N/A	Y
39	Handoff Countdown	ho_cntdn	Int	N/A	0..63	N/A	N
40	Handoff status	ho_stat	Enum	N/A	0..IF_HO_2_ARTCC	N/A	Y
41	Count of DX messages received	if_dx	Int	N/A	0..IF_ITRQ	N/A	N
42	Count of attempts to send a msg	if_msgcount	Int	N/A	0..IF_MAX_RETRY	N/A	N
43	ARTCC sector handing off to	if_sector	INt	N/A	0..31	N/A	N
44	ARTCC site messages are sent to	if_site	Int	N/A	0..3	N/A	N
45	IF message status	if_stat	Enum	N/A	0..24	N/A	N
46	Keyboard subset	kbd_subset	Int	N/A	1..7	N/A	N
47	Leader direction from change req	ldr_dir	Enum	N/A	0..7	N/A	N
48	Active radar subsystem	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	N/A	N
49	Track type	status_tp	Enum	N/A	0..3	N/A	N
50	Track usage status	status_ut	Enum	N/A	1..3	N/A	N
51	Tab coast out-of-range tracks	tab_or	Enum	N/A	0.2.3	N/A	N
52	Display number for VFR list	vfr_dsp_nbr	Int	N/A	1..MAX_NUMDQ	N/A	N
53	VFR fp stat	vfr_fp_stat	Enum	N/A	0..3	N/A	N
54	4 Aircraft type characters	ac_type[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
55	4 Aircraft type characters	ac_type[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
56	Track assigned altitude	alt_asg[[4]=1]	ASCII	ft	NULL 001..999	100 ft	N
57	Track assigned altitude	alt_asg[[4]= 4]	ASCII	ft	NULL 001..999	100 ft	N
58	Symbol and Subset of ART-ART UHO	art2art_uho[[2]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
59	Symbol and Subset of ART-ART UHO	art2art_uho[[2]=2]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
60	ARTS to ARTS symbol	atoa_sym	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
61	Airport and SS entry fixes	entry_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
62	Airport and SS entry fixes	entry_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
63	Airport and SS exit fixes	exit_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
64	Airport and SS exit fixes	exit_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
65	Exit Fix characters	exitfix_char[[MAX_AREA_LEVELS]=1]	ASCII	N/A	'A'-'Z'	N/A	N
66	Exit Fix characters	exitfix_char[[MAX_AREA_LEVELS]= 10]	ASCII	N/A	'A'-'Z'	N/A	N
67	8 Aircraft ID characters	fid[[8]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
68	8 Aircraft ID characters	fid[[8]= 8]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
69	Fix Pair Scratch Pad	fixpair_scratpad[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
70	Fix Pair Scratch Pad	fixpair_scratpad[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
71	ECID (ddA)	if_ecid[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
72	ECID (ddA)	if_ecid[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
73	TCID of other ARTS site	if_tcid[[3]=1]	ASCII	N/A	'0'-'9'	N/A	N

74	TCID of other ARTS site	if_tcid[[3]= 3]	ASCII	N/A	'0'-'9'	N/A	N
75	Keyboard symbol	kybdsymb	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
76	Satellite airport symbol	sat_apt	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
77	Scratch Pad 1 Characters	scratch_pad[[3]= 1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
78	Scratch Pad 1 Characters	scratch_pad[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
79	Scratch Pad 2 Characters	scratch_pad2[[3] =1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
80	Scratch Pad 2 Characters	scratch_pad2[[3] = 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
81	Site adapted alpha character	sitechar	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
82	Tabular line identifier	tablinid	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	Y
83	VFR FP Tab Line Identifier	vfrfp_linid	ASCII	N/A	'0'-'9' space	N/A	N
84	Auto-acquire flag	aa	Boolean	N/A	0..1	N/A	N
85	Assigned Altitude flag	asng_alt	Boolean	N/A	0..1	N/A	N
86	BRITE eligibility indicator	brite_eligib	Boolean	N/A	0..1	N/A	N
87	Inhibit CA single trk ind	cai_inh_proc	Boolean	N/A	0..1	N/A	N
88	Inhibt CA ind for trk pair	cai_pair	Boolean	N/A	0..1	N/A	N
89	VFR beacon code inhib indicator	cai_vfr_rbc	Boolean	N/A	0..1	N/A	N
90	CA inhibit zone suppress	cai_zone_sup	Boolean	N/A	0..1	N/A	N
91	CA alert display indicator	disp_ca	Boolean	N/A	0..1	N/A	N
92	MSAW Climb indicator	disp_climb	Boolean	N/A	0..1	N/A	N
93	Display DB indicator	disp_db	Boolean	N/A	0..1	N/A	N
94	Display DM indicator	disp_dm	Boolean	N/A	0..1	N/A	N
95	Display/retain FDB indicator	disp_fdb	Boolean	N/A	0..1	N/A	N
96	Display blinking FP indicator	disp_fp	Boolean	N/A	0..1	N/A	N
97	Display blinking IF indicator	disp_if	Boolean	N/A	0..1	N/A	N
98	MSAW warning indictor	disp_la	Boolean	N/A	0..1	N/A	N
99	Display interfacility NAT ind	disp_nat	Boolean	N/A	0..1	N/A	N
100	Display OLD indicator	disp_old	Boolean	N/A	0..1	N/A	N
101	Display Pointout indicator	disp_po	Boolean	N/A	0..1	N/A	N
102	Emer/radio fail/hijack indicator	em	Boolean	N/A	0..1	N/A	N
103	Exit Fix is Primary Airport ind	exitfix_is_pri_ap t	Boolean	N/A	0..1	N/A	N
104	Flashing ABC indicator	flash_abc	Boolean	N/A	0..1	N/A	N
105	Forced control change	force_ctl_chg	Boolean	N/A	0..1	N/A	N
106	Freeze full data block indicator	frz_fdb	Boolean	N/A	0..1	N/A	N
107	Global leader dir ind F7 L dd	global_ldr	Boolean	N/A	0..1	N/A	N
108	Heavy aircraft indicator	heavy	Boolean	N/A	0..1	N/A	N
109	Interfacility handoff complete	ho_comp	Boolean	N/A	0..1	N/A	N
110	Inhibit auto acquisition	iaa	Boolean	N/A	0..1	N/A	N
111	Interfacility late hand-off ind	iaf_lho	Boolean	N/A	0..1	N/A	N
112	IF ARSA Indicator	if_arsa	Boolean	N/A	0..1	N/A	N
113	IF AHO inhibited (delta) flag	if_delta	Boolean	N/A	0..1	N/A	N

114	IF late handoff indicator	if_lho	Boolean	N/A	0..1	N/A	N
115	Inhibit a/c type indicatr	inhactyp	Boolean	N/A	0..1	N/A	N
116	Inhibit Mode C altitude	inhmodec	Boolean	N/A	0..1	N/A	N
117	Inhibit AMB indicator	inh_amb	Boolean	N/A	0..1	N/A	N
118	Inhibit blinking HO	inh_bho	Boolean	N/A	0..1	N/A	N
119	Inhibit auto-handoff	inh_ifaho	Boolean	N/A	0..1	N/A	N
120	Display intrafacility NAT ind	intra_nat	Boolean	N/A	0..1	N/A	N
121	MSAW alert display indicator	lai_inh_disp	Boolean	N/A	0..1	N/A	N
122	Inhibit MSAW processing ind	lai_inh_proc	Boolean	N/A	0..1	N/A	N
123	Leader Direction Change Request	ldr_dir_chg	Boolean	N/A	0..1	N/A	N
124	Out of range indicator	outofrng	Boolean	N/A	0..1	N/A	N
125	Radar only flight plan indicator	rdr_only	Boolean	N/A	0..1	N/A	N
126	Ring remote MSAW alarm	remote_alarm	Boolean	N/A	0..1	N/A	N
127	MSAW alarm indicator	ring_msaw	Boolean	N/A	0..1	N/A	N
128	Satellite List Entry	sat_list_entry	Boolean	N/A	0..1	N/A	N
129	Suspend out-of-range indicator	sdor	Boolean	N/A	0..1	N/A	N
130	Special Offset	sp_off	Boolean	N/A	0..1	N/A	N
131	Track active status	status_a	Boolean	N/A	0..1	N/A	N
132	Suspend trk trk/not trk	susp_trk_not_trk	Boolean	N/A	0..1	N/A	N
133	Suspend track special symbol	sus_trk_sym	Boolean	N/A	0..1	N/A	N
134	TA beacon code received	taval	Boolean	N/A	0..1	N/A	N
135	TI beacon code received	tival	Boolean	N/A	0..1	N/A	N
136	Live/training track indicator	tng	Boolean	N/A	0..1	N/A	N
137	VFR Fix intermediate flag	vfrfp_fixint	Boolean	N/A	0..1	N/A	N
138	VFR fp originated at ARTS	vfr_arts	Boolean	N/A	0..1	N/A	N
139	VFR flight plan	vfr_fp	Boolean	N/A	0..1	N/A	N
140	Zone/floor suppress indicator	zone_sup	Boolean	N/A	0..1	N/A	N
141	Pad	unused	N/A	N/A	N/A	N/A	N

15.3.5.9.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Flight Plan Maintenance Msg code	Message Code = 1316	uns16	1	31-16
2	Flight Plan Maintenance Msg length	Message Length = 248 bytes	uns16	1	15-0
3	Assigned beacon code		uns16	2	31-16
4	Active controller		uns16	2	15-0
5	Auto-handoff altitude		uns16	3	31-16
6	Track requested altitude		int16	3	15-0
7	Flight Plan assigned altitude		int16	4	31-16
8	ETA/PTD in minutes since midnight		uns16	4	15-0
9	FDF Number		uns16	5	31-16
10	Directed Handoff controller		uns16	5	15-0
11	IF message number		uns16	6	31-16
12	IF message time delta	(seconds)	uns16	6	15-0
13	IF TU time delta	(seconds)	uns16	7	31-16
14	Old Primary Controller		uns16	7	15-0
15	Primary controller		uns16	8	31-16
16	Run Down List		uns16	8	15-0
17	Satellite List Azimuth	from airport	uns16	9	31-16
18	Satellite List Range	from airport	uns16	9	15-0
19	TCID		uns16	10	31-16
20	TI/TA beacon code		uns16	10	15-0
21	Track number (per sensor)		uns16	11	31-16
22	Track number (per sensor)		uns16	18	31-16
23	Sensor link/no link indicator	These [Fields = 2] are repeated [[MAX_SENSQ] =1] times	boolean	18	15-8
24	Sensor real/pseudo link indicator		boolean	18	7-0
25	Sensor link/no link indicator	These [Fields = 2] are repeated [[MAX_SENSQ] = 15] times	boolean	25	15-8
26	Sensor real/pseudo link indicator		boolean	25	7-0
27	Assigned beacon code status	ABC_EXISTS(0)=assigned TENT_ABC(1)=tentative assigned NO_ABC(2)=no assigned	uns8	26	31-24
28	ACID number of non-space chars		uns8	26	23-16
29	Aircraft category		uns8	26	15-8
30	Original Aircraft category		uns8	26	7-0
31	Arrival/Departure/Enroute status	Must be ADE_OVERFLIGHT or ADE_ARR_UNKNOWN..ADE_ARRU or ADE_DEP_UNKNOWN..ADEPU	uns8	27	31-24
32	Auto-handoff index		int8	27	23-16
33	Adjacent ARTS ID		uns8	27	15-8
34	Aircraft type disp counter		uns8	27	7-0
35	BRITE List Nr by Geo Area		uns8	28	31-24
36	BRITE List Nr by Geo Area		uns8	29	7-0

37	Flight plan adaptor number		uns8	30	31-24
38	FP status controlled VFR flight	0 = IFR1 = VFR2 = VFR_ON_TOP	uns8	30	23-16
39	Handoff Countdown		uns8	30	15-8
40	Handoff status	0=not in handoff 1=intrafacility countdown 2=interfacility countdown 3=intrafacility 4=to ARTCC 5=from ARTCC	uns8	30	7-0
41	Count of DX messages received		uns8	31	31-24
42	Count of attempts to send a msg		uns8	31	23-16
43	ARTCC sector handing off to		uns8	31	15-8
44	ARTCC site messages are sent to		uns8	31	7-0
45	IF message status	See text	uns8	32	31-24
46	Keyboard subset		uns8	32	23-16
47	Leader direction from change req	LDR_N(0)=North LDR_NE(1)=Northeast LDR_E(2)=EastLDR_SE(3)=Southeast LDR_S(4)=South LDR_SW(5)=Southwest LDR_W(6)=WestLDR_NW(7)=Northwest	uns8	32	15-8
48	Active radar subsystem		uns8	32	7-0
49	Track type	0=store 1=tab coast 2=suspend not tracking 3=suspend	uns8	33	31-24
50	Track usage status	ASSOCIATED(1)=associated UNASSOCIATED(3)=unassociated	uns8	33	23-16
51	Tab coast out-of-range tracks	0=not OR 2=OR 3=blinking OR	uns8	33	15-8
52	Display number for VFR list		uns8	33	7-0
53	VFR fp stat	0=VFR 1=FIX 2=IFP	uns8	34	31-24
54	4 Aircraft type characters		char	34	23-16
55	4 Aircraft type characters		char	35	31-24
56	Track assigned altitude		char	35	23-16
57	Track assigned altitude		char	36	31-24
58	Symbol and Subset of ART-ART UHO		char	36	23-16
59	Symbol and Subset of ART-ART UHO		char	36	15-8
60	ARTS to ARTS symbol		char	36	7-0
61	Airport and SS entry fixes		char	37	31-24
62	Airport and SS entry fixes		char	37	7-0
63	Airport and SS exit fixes		char	38	31-24
64	Airport and SS exit fixes		char	38	7-0
65	Exit Fix characters		char	39	31-24
66	Exit Fix characters		char	41	23-16
67	8 Aircraft ID characters		char	41	15-8
68	8 Aircraft ID characters		char	43	23-16
69	Fix Pair Scratch Pad		char	43	15-8
70	Fix Pair Scratch Pad		char	44	31-24
71	ECID (ddA)		char	44	23-16

72	ECID (ddA)		char	44	7-0
73	TCID of other ARTS site		char	45	31-24
74	TCID of other ARTS site		char	45	15-8
75	Keyboard symbol		char	45	7-0
76	Satellite airport symbol		char	46	31-24
77	Scratch Pad 1 Characters		char	46	23-16
78	Scratch Pad 1 Characters		char	46	7-0
79	Scratch Pad 2 Characters		char	47	31-24
80	Scratch Pad 2 Characters		char	47	15-8
81	Site adapted alpha character		char	47	7-0
82	Tabular line identifier		char	48	31-24
83	VFR FP Tab Line Identifier		char	48	23-16
84	Auto-acquire flag		boolean	48	15-8
85	Assigned Altitude flag		boolean	48	7-0
86	BRITE eligibility indicator		boolean	49	31-24
87	Inhibit CA single trk ind		boolean	49	23-16
88	Inhibt CA ind for trk pair		boolean	49	15-8
89	VFR beacon code inhib indicator		boolean	49	7-0
90	CA inhibit zone suppress		boolean	50	31-24
91	CA alert display indicator		boolean	50	23-16
92	MSAW Climb indicator		boolean	50	15-8
93	Display DB indicator		boolean	50	7-0
94	Display DM indicator		boolean	51	31-24
95	Display/retain FDB indicator		boolean	51	23-16
96	Display blinking FP indicator		boolean	51	15-8
97	Display blinking IF indicator		boolean	51	7-0
98	MSAW warning indictor		boolean	52	31-24
99	Display interfacility NAT ind		boolean	52	23-16
100	Display OLD indicator		boolean	52	15-8
101	Display Pointout indicator		boolean	52	7-0
102	Emer/radio fail/hijack indicator		boolean	53	31-24
103	Exit Fix is Primary Airport ind		boolean	53	23-16
104	Flashing ABC indicator		boolean	53	15-8
105	Forced control change		boolean	53	7-0
106	Freeze full data block indicator		boolean	54	31-24
107	Global leader dir ind F7 L dd		boolean	54	23-16
108	Heavy aircraft indicator		boolean	54	15-8
109	Interfacility handoff complete		boolean	54	7-0
110	Inhibit auto acquisition		boolean	55	31-24
111	Interfacility late hand-off ind		boolean	55	23-16
112	IF ARSA Indicator		boolean	55	15-8
113	IF AHO inhibited (delta)		boolean	55	7-0

	flag				
114	IF late handoff indicator		boolean	56	31-24
115	Inhibit a/c type indicatr		boolean	56	23-16
116	Inhibit Mode C altitude		boolean	56	15-8
117	Inhibit AMB indicator		boolean	56	7-0
118	Inhibit blinking HO		boolean	57	31-24
119	Inhibit auto-handoff		boolean	57	23-16
120	Display intrafacility NAT ind		boolean	57	15-8
121	MSAW alert display indicator		boolean	57	7-0
122	Inhibit MSAW processing ind		boolean	58	31-24
123	Leader Direction Change Request		boolean	58	23-16
124	Out of range indicator		boolean	58	15-8
125	Radar only flight plan indicator		boolean	58	7-0
126	Ring remote MSAW alarm		boolean	59	31-24
127	MSAW alarm indicator		boolean	59	23-16
128	Satellite List Entry		boolean	59	15-8
129	Suspend out-of-range indicator		boolean	59	7-0
130	Special Offset		boolean	60	31-24
131	Track active status		boolean	60	23-16
132	Suspend trk trk/not trk		boolean	60	15-8
133	Suspend track special symbol		boolean	60	7-0
134	TA beacon code received		boolean	61	31-24
135	TI beacon code received		boolean	61	23-16
136	Live/training track indicator		boolean	61	15-8
137	VFR Fix intermediate flag		boolean	61	7-0
138	VFR fp originated at ARTS		boolean	62	31-24
139	VFR flight plan		boolean	62	23-16
140	Zone/floor suppress indicator		boolean	62	15-8
141	Pad	End of msg pad	uns8	62	7-0

15.3.5.10 ADAR Heartbeat Msg (m_adar_hbeat)

This submessage is sent to the AGW once per second. The CTIS CSCI will process this message to determine the presence of the ADAR and the condition of the interconnecting network link. Contains of message is identical to CTIS Heartbeat Message.

15.3.5.10.1 Destination/Source Data

msgsource	msgdest	method	frequency
ADAR	CTIS	PP	Every half second

15.3.5.10.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	Training Status (1-training 0-ops)	trng_status	Boolean	N/A	0..1	N/A	N
4	FAST Enabled (1-enabled)	fast_enable	Boolean	N/A	0..1	N/A	N
5	FAST Availability (1-available)	fast_avail	Boolean	N/A	0..1	N/A	N
6	Pad msg to multiple of 32 bits	pad[[1]=1]	char	N/A	N/A	N/A	N
7	Pad msg to multiple of 32 bits	pad[[1]= 1]	char	N/A	N/A	N/A	N

15.3.5.10.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1304	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	Training Status (1-training 0-ops)		uns8	2	31-24
4	FAST Enabled (1-enabled)		uns8	2	23-16
5	FAST Availability (1-available)		uns8	2	15-8
6	Pad msg to multiple of 32 bits		uns8	2	7-0
7	Pad msg to multiple of 32 bits		uns8	2	7-0

15.3.5.11 ADAR TP Heartbeat Message (m_adar_tp_hbeat)

External form of the TP Heartbeat Message (1708) This submessage is sent to the CP, DP, and SMC subsystems. It contains the system time, training time, the status of the SMC and CP subsystems, the system mode, the gateway status, auto-switching information, and an indication of which sensors have Radar Overload Protection enabled/disabled.

15.3.5.11.1 Destination/Source Data

msgsource	msgdest	method	frequency
CTIS	ADAR	PP	1/TP Heartbeat Message (1/0.5 seconds)

15.3.5.11.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	TP Heartbeat Message Code	code	Int	code	0..xFFFF	N/A	Y
2	TP Heartbeat Message Length	lgth	Int	bytes	4..MAXSUBMSGL	1	Y
3	Current Zulu Time	time	Int	mils	0..4294967294	1	N
4	Training Time	trng_time	Int	mils	0..4294967294	1	N
5	Current Altimeter Setting	altimeter_value[[MAX_ALSTGS][2]=1]	Scaled	Inches	27..32	1/512	N
6	Current Altimeter Setting	altimeter_value[[MAX_ALSTGS][2]= 20]	Scaled	Inches	27..32	1/512	N
7	Time Altitude Was Updated	altimeter_time[[MAX_ALSTGS][2]=1]	Int	Minutes	0..1439	1	N
8	Time Altitude Was Updated	altimeter_time[[MAX_ALSTGS][2]= 20]	Int	Minutes	0..1439	1	N
9	Day of Year	day_of_year	Int	Days	1..366	1	N
10	Current Year	year	Int	Years	1970..2037	1	N
11	Unused Field	unused1					
12	Index Number of Active Path	active_path[[MAX_SENSQ]=1]	Int	N/A	0..MAX_SENSOR_PATHS	1	N
13	Index Number of Active Path	active_path[[MAX_SENSQ]= 15]	Int	N/A	0..MAX_SENSOR_PATHS	1	N
14	Number of This TPS	mtp_number	Int	N/A	1..3	1	N
15	Remote System Monitor Status	rsm[[MAX_RSM + 1]=1]	Enumeration	N/A	0..1	N/A	Y
16	Remote System Monitor Status	rsm[[MAX_RSM + 1]= 13]	Enumeration	N/A	0..1	N/A	Y
17	System mode	system_mode	Enumeration	N/A	0..3	N/A	N
18	TP mode	tp_mode	Enumeration	N/A	0..2	N/A	N
19	Hard Disk Status	hd_stat[[2]=1]	Enum	N/A	0..1	N/A	N
20	Hard Disk Status	hd_stat[[2]= 2]	Enum	N/A	0..1	N/A	N
21	Floppy Disk Status	fd_stat	Enum	N/A	0..1	N/A	N

22	Automatic Switching Indicator	auto_switch[[MAX_SENSQ]=1]	Boolean	N/A	0..1	N/A	N
23	Automatic Switching Indicator	auto_switch[[MAX_SENSQ]= 15]	Boolean	N/A	0..1	N/A	N
24	DASI Status	dasi_status[[MAX_CPS][MAX_DASI + 1]=1]	Boolean	N/A	0..1	N/A	N
25	DASI Status	dasi_status[[MAX_CPS][MAX_DASI + 1]= 33]	Boolean	N/A	0..1	N/A	N
26	State of Input Path	input_path_avail[[MAX_SENSQ][MAX_SENSOR_PATHS]=1]	Boolean	N/A	0..1	N/A	N
27	State of Input Path	input_path_avail[[MAX_SENSQ][MAX_SENSOR_PATHS]= 60]	Boolean	N/A	0..1	N/A	N
28	State of Input Port	input_port_avail[[MAX_SENSQ][MAX_SENSOR_PATHS][MAX_PORT_PATH]=1]	Boolean	N/A	0..1	N/A	N
29	State of Input Port	input_port_avail[[MAX_SENSQ][MAX_SENSOR_PATHS][MAX_PORT_PATH]= 300]	Boolean	N/A	0..1	N/A	N
30	Sensor Overload Enabled	sovrld[[MAX_SENSQ]=1]	Boolean	N/A	0..1	N/A	N
31	Sensor Overload Enabled	sovrld[[MAX_SENSQ]= 15]	Boolean	N/A	0..1	N/A	N
32	Sensor Segment Mask Enabled	sm[[MAX_SENSQ][MAX_SEG_MASKS + 1]=1]	Boolean	N/A	0..1	N/A	N
33	Sensor Segment Mask Enabled	sm[[MAX_SENSQ][MAX_SEG_MASKS + 1]= 60]	Boolean	N/A	0..1	N/A	N
34	Sensor Up Status	sensor_up[[MAX_SENSQ]=1]	Boolean	N/A	0..1	N/A	N
35	Sensor Up Status	sensor_up[[MAX_SENSQ]= 15]	Boolean	N/A	0..1	N/A	N
36	SMC Status	smc_stat	Boolean	N/A	0..1	N/A	N
37	Synchronized Flag	sync_flag	Boolean	N/A	0..1	N/A	N
38	CP Heartbeat received	cp_hbeat	Boolean	N/A	0..1	N/A	N
39	VME Memory Change Enabled	vre_enable	Boolean	N/A	0..1	N/A	N
40	Sifacs Active	sifacs_active	Boolean	N/A	0..1	N/A	N
41	RETRACK Active (For ETG Purposes)	retrack_active	Boolean	N/A	0..1	N/A	N
42	Status Of Altimeter Data	altimeter_status[	Character	N/A	N/A	N/A	N

		[MAX_ALSTG S][2]=1]					
43	Status Of Altimeter Data	altimeter_status[[MAX_ALSTG S][2]= 20]	Character	N/A	N/A	N/A	N
44	Raw Altimeter Characters	raw_altim_chars [[MAX_ALSTG S][2][4]=1]	Character	N/A	N/A	N/A	N
45	Raw Altimeter Characters	raw_altim_chars [[MAX_ALSTG S][2][4]= 80]	Character	N/A	N/A	N/A	N

15.3.5.11.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	TP Heartbeat Message Code	Message Code = 1317	uns16	1	31-16
2	TP Heartbeat Message Length	Message Length = 736 bytes	uns16	1	15-0
3	Current Zulu Time		uns32	2	31-0
4	Training Time		uns32	3	31-0
5	Current Altimeter Setting		uns16	4	31-16
6	Current Altimeter Setting		uns16	13	15-0
7	Time Altitude Was Updated		uns16	14	31-16
8	Time Altitude Was Updated		uns16	23	15-0
9	Day of Year		uns16	24	31-16
10	Current Year		uns16	24	15-0
11	Unused Field		uns16	25	31-16
12	Index Number of Active Path		uns8	25	15-8
13	Index Number of Active Path		uns8	29	31-24
14	Number of This TPS		uns8	29	23-16
15	Remote System Monitor Status	RSM_INHIBITED(0) RSM_SELECTED(1)	uns8	29	15-8
16	Remote System Monitor Status	RSM_INHIBITED(0) RSM_SELECTED(1)	uns8	32	15-8
17	System mode	NORMAL(0)=normal FULL_UP(0)=CP/TP all resources ALTERNATE(1)=No Standby CP/TP/SMON BACKUP(3)=backup (no CP subsystem)	uns8	32	7-0
18	TP mode	ACTIVE(0) STANDBY(1) OFF-LINE(2) IDLE(3)	uns8	33	31-24
19	Hard Disk Status	(1=disabled)	uns8	33	23-16
20	Hard Disk Status	(1=disabled)	uns8	33	15-8
21	Floppy Disk Status	(1=disabled)	uns8	33	7-0
22	Automatic Switching Indicator		boolean	34	31-24
23	Automatic Switching Indicator		boolean	37	15-8
24	DASI Status		boolean	37	7-0
25	DASI Status		boolean	45	7-0
26	State of Input Path		boolean	46	31-24
27	State of Input Path		boolean	60	7-0

28	State of Input Port		boolean	61	31-24
29	State of Input Port		boolean	135	7-0
30	Sensor Overload Enabled		boolean	136	31-24
31	Sensor Overload Enabled		boolean	139	15-8
32	Sensor Segment Mask Enabled		boolean	139	7-0
33	Sensor Segment Mask Enabled		boolean	154	15-8
34	Sensor Up Status		boolean	154	7-0
35	Sensor Up Status		boolean	158	23-16
36	SMC Status		boolean	158	15-8
37	Synchronized Flag		boolean	158	7-0
38	CP Heartbeat received		boolean	159	31-24
39	VME Memory Change Enabled		boolean	159	23-16
40	Sifacs Active		boolean	159	15-8
41	RETRACK Active (For ETG Purposes)		boolean	159	7-0
42	Status Of Altimeter Data		char	160	31-24
43	Status Of Altimeter Data		char	164	7-0
44	Raw Altimeter Characters		char	165	31-24
45	Raw Altimeter Characters		char	184	7-0

15.3.5.12 CDR FAST Advisory Msg (m_cdr_advise)

This submessage is sent for each associated arrival track receiving FAST advisories. This submessage is recorded by CDR when the extraction class "FS" is enabled.

15.3.5.12.1 Destination/Source Data

msgsource	msgdest	method	frequency
ADAR	CTIS	PP	As Requested
CTIS	SMON	BQ	As Requested

15.3.5.12.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	Current ZULU Time	time	Int	mils	0..4294967294	1	N
4	FDF Number	fp_nbr	Int	N/A	1..MAX_FDFQ	N/A	N
5	ACID(NULL terminated)	fid[[8]=1]	char	N/A	N/A	N/A	N
6	ACID(NULL terminated)	fid[[8]= 8]	char	N/A	N/A	N/A	N
7	Buffer 1 Validity flag (1 = valid)	v1	Boolean	N/A	0..1	N/A	N
8	Buffer 2 Validity flag (1 = valid)	v2	Boolean	N/A	0..1	N/A	N
9	training status(0=live 1=training)	training	Boolean	N/A	0..1	N/A	N
10	Buffer 1	seq[[10]=1]	char	N/A	N/A	N/A	N
11	Buffer 1	seq[[10]= 10]	char	N/A	N/A	N/A	N
12	Buffer 2	rwy[[10]=1]	char	N/A	N/A	N/A	N
13	Buffer 2	rwy[[10]= 10]	char	N/A	N/A	N/A	N
14	Pad msg to multiple of 32 bits	pad[[1]=1]	char	N/A	N/A	N/A	N
15	Pad msg to multiple of 32 bits	pad[[1]= 3]	char	N/A	N/A	N/A	N

15.3.5.12.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1306	uns16	1	31-16
2	Submessage length	Message Length = 44 bytes	uns16	1	15-0
3	Current ZULU Time		uns32	2	31-0
4	FDF Number		uns16	3	31-16
5	ACID(NULL terminated)		char	3	15-8
6	ACID(NULL terminated)		char	5	23-16
7	Buffer 1 Validity flag (1 = valid)		uns8	5	15-8
8	Buffer 2 Validity flag (1 = valid)		uns8	5	7-0
9	training status(0=live 1=training)		uns8	6	31-24
10	Buffer 1		char	6	23-16
11	Buffer 1		char	8	15-8
12	Buffer 2		char	8	7-0
13	Buffer 2		char	11	31-24
14	Pad msg to multiple of 32 bits		uns8	11	23-16
15	Pad msg to multiple of 32 bits		uns8	11	7-0

15.3.5.13 FAST Advisory Msg (m_fast_advise)

This submessage is sent for each associated arrival track receiving FAST advisories. This submessage is transmitted each scan to permit initialization of any display within one scan. This submessage is recorded by CDR when the extraction class is enabled.

15.3.5.13.1 Destination/Source Data

msgsource	msgdest	method	frequency
ADAR	CTIS	PP	As Requested
CTIS	DPS	BM	As Requested

15.3.5.13.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	FDF Number	fp_nbr	Int	N/A	1..MAX_FDFQ	N/A	N
4	ACID(NULL terminated)	fid[[8]=1]	char	N/A	N/A	N/A	N
5	ACID(NULL terminated)	fid[[8]= 8]	char	N/A	N/A	N/A	N
6	Buffer 1 Validity flag (1 = valid)	v1	Boolean	N/A	0..1	N/A	N
7	Buffer 2 Validity flag (1 = valid)	v2	Boolean	N/A	0..1	N/A	N
8	training status(0=live 1=training)	training	Boolean	N/A	0..1	N/A	N
9	Buffer 1	seq[[10]=1]	char	N/A	N/A	N/A	N
10	Buffer 1	seq[[10]= 10]	char	N/A	N/A	N/A	N
11	Buffer 2	rwy[[10]=1]	char	N/A	N/A	N/A	N
12	Buffer 2	rwy[[10]= 10]	char	N/A	N/A	N/A	N
13	Pad msg to multiple of 32 bits	pad[[3]=1]	char	N/A	N/A	N/A	N
14	Pad msg to multiple of 32 bits	pad[[3]= 3]	char	N/A	N/A	N/A	N

15.3.5.13.3 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1305	uns16	1	31-16
2	Submessage length	Message Length = 40 bytes	uns16	1	15-0
3	FDF Number		uns16	2	31-16
4	ACID(NULL terminated)		char	2	15-8
5	ACID(NULL terminated)		char	4	23-16
6	Buffer 1 Validity flag (1 = valid)		uns8	4	15-8
7	Buffer 2 Validity flag (1 = valid)		uns8	4	7-0
8	training status(0=live 1=training)		uns8	5	31-24
9	Buffer 1		char	5	23-16
10	Buffer 1		char	7	15-8
11	Buffer 2		char	7	7-0
12	Buffer 2		char	10	31-24
13	Pad msg to multiple of 32 bits		uns8	10	23-16
14	Pad msg to multiple of 32 bits		uns8	10	7-0

15.3.5.14 ADAR Delete Flight Data Msg (m_adar_d_fp)

External form of the Delete Flight Data Msg (1809)

This submessage is sent whenever the CP sets an FDF record to unused. It is used to inform the DP to set the corresponding FDF record to unused status.

15.3.5.14.1 Destination/Source Data

msgsource	msgdest	method	frequency
CTIS	ADAR	PP	1/Delete Flight Data Message

15.3.5.14.2 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
3	Record number in CP FDF	tp_nbr	Int	N/A	1..MAX_FDFQ	1	Y
4	Sensor number	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	1	N
5	Live/training track indicator	training	Boolean	N/A	0..1	N/A	N

15.3.5.14.3. Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1321	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	Record number in CP FDF		uns16	2	31-16
4	Sensor number		uns8	2	15-8
5	Live/training track indicator		boolean	2	7-0

Section 16
NOISE MONITORING INTERFACE

16.1 GENERAL DESCRIPTION

The Noise Monitoring Interface provides tracking and flight plan information to external data collection and analysis tools. Common ARTS provides this interface through a generic firewall capability through the use of an ARTS Interface Gateway Chassis (AGW). The AGW runs various processes to interface and convert messages between Common ARTS and other equipment and acts to isolate the external equipment from the operational local area networks. An implementation of the Common Terminal Interface Software (CTIS) is used to convert the current Common ARTS messages to an external form used by the Noise Monitoring system.

16.2 REFERENCED DOCUMENTS

16.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

16.2.1.1 Applicable Government Documents

Specifications

ATC 60050 Common ARTS Interface Design Document

Standards

None.

Other Publications

None.

16.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

FIPS PUB 160 American National Standard for Information Systems - Programming Language – C

ANSI/IEEE Standard 802.3 - Institute of Electrical and Electronic Engineers-Local Area Networks International Standards Organization (ISO) Open System Interconnect (OSI) Reference Mode and ISO Communication Protocol Standards.

IETF STD-0005 Internet Protocol, September 1981

IETF STD-0007 Transmission Control Protocol, September 1981

IETF STD-0041 Standard for the transmission of IP datagrams over Ethernet networks, April 1984

Other Publications

None.

16.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993.

FAA Computer Program Functional Specifications

ARTS NAS-MD-634, A6.05/A2.09	System Description and Specified Series, Final, Rev. A, November 1997
ARTS NAS-MD-638, A6.05/A2.09	Keyboard, Final, Rev. A, November 1997
ARTS NAS-MD-639, A6.05/A2.09	Display Output Processing and Converging Runway Display Aid (CRDA), Final, Rev. A, November 1997
ARTS NAS-MD-642, A6.05/A2.09	Error and Status Messages, Final, Rev. A, November 1997
ARTS NAS-MD-643, A6.05/A2.09	Site Adaptation, Final, Rev. A, November 1997
ARTS NAS-MD-646, A6.05/A2.09	CDR Editor, RETRACK and Disk/File Utilities, Final, Rev. A, November 1997
ARTS NAS-MD-648, A6.05/A2.09	Continuous Data Recording Processing and Performance Monitoring, Final, Rev. A, November 1997

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

16.3 NOISE MONITORING INTERFACE

16.3.1 General Information

The Common ARTS Interface to the Noise Monitoring Data Collection PC is through a 100 megabit per second ethernet running TCP/IP protocols. The ethernet interface in the AGW is used to communicate to the ethernet port on the ANOM PC. The AGW hardware in the IIIE system is made up of two VME Chassis's connected to two independent Cisco firewalls which are then connected to a hub. The AGW hardware in the IIE system is made up of a single PC connected directly to a hub.

16.3.2 Mechanical Characteristics

The ethernet connection on either the IIIE or IIE versions of the AGW are made of a RJ45 architecture. All the external systems that wish to interface to the Common ARTS system will use a RJ45 cable over a 10/100 Mbit connection to attach their computer to the same hub as that of the AGW.

16.3.3 Electrical Characteristics

The RJ45 interface that connects to the hub conforms to the industry standard layout defined for this interface. A 100 Mbit RJ45 connection is highly recommended to minimize 10Mbit bottlenecks on the network.

The PowerPC version of the AGW is a RJ45 10/100 connection into a CISCO Firewall/Router or directly into the AGW depending on site adaptation. Normal configuration is a RJ45(Cat. 5) connection into a Switch in route to a CISCO Firewall/Router(connected to the AGW), which conforms to the industry standard RJ45 10/100 Cat 5 configuration for this interface.

The Linux i86 version of the AGW is a RJ45 10/100 connection directly into the AGW or a 10/100 Switch(sites with multiple AGW clients) which conforms to the industry standard layout for this interface.

16.3.4 Network Protocol

The Noise Monitor interface to the Common ARTS system uses TCP/IP protocols. The Common Terminal Interface Software (CTIS) process running in the AGW acts as a TCP server. In order to provide multiple paths to various Noise Monitoring systems four processes are utilized (anom1, anom2, anom3 and anom4), they are designed to communicate on ports **5035**, **5040**, **5045** and **5050** respectively. All data is passed in network byte order (big endian). The IP address for this interface is set in Common ARTS Adaptation and is physically set by CTIS when the program initializes.

Messages are passed to and from the Common ARTS AGW using a simple higher level protocol running on top of the TCP/IP. Each message consists of a 2 byte code field and 2 byte length field followed by one or more submessages. The length specifies the total length of all of the submessages including the 4 bytes for code and length that make up this message.

16.3.5 Data Format

The submessages each have a 2 byte submessage code and a 2 byte length followed by data specific to the submessage. The submessage length does include the length of the code and length fields thus no submessage can be less than 4 bytes long and likewise no message can be less than 4 bytes long.

Submessages from AGW to Noise Monitor PC

Submessage	Code
NM Active Track Maintenance Msg	0x1350
NM Delete Flight Data Msg	0x1351
NM Delete Track Msg	0x1352
NM Flight Plan Maintenance Msg	0x1353
NM CTIS Heartbeat Msg	0x1354

Submessages from PC to AGW

Submessage	Code
NM PC Heartbeat Msg	0x1355

The detail structure of the submessages are described in the following sections. Typically, these structures are defined as C data structures which are included with the application program that processes the messages.

16.3.5.1 NM Active Track Maintenance Msg (m_nm_atm)

External form of Active Track Maintenance Msg (1700). The Active Track Maintenance (ATM) message is sent from various CSCIs to indicate to the receiving CSCIs that track data has been updated. It contains the updated track position, speed, altitude, etc. The ATM message is most commonly sent by TPS and received by CPS (for linking and FP association), DPS (for display), and SMON (for recording). It is sent once per track per scan via the Track Sensor Multiqueue.

ATMs come in two categories: "principal" and "subordinate". Principal ATMs are sent in the normal case (as described above) for all tracks in all sensors, including ARSRs. Subordinate ATM messages are used in the special case when a Display Sensor Switch command is entered and an ARSR is selected to backup a given ASR. When this condition is present, TPS adds data to the message to provide transformed XY coordinates (relative to the specific ASR) and sends the ATM again via another multiqueue. This additional multiqueue is named appropriately to define the specific ARSR-ASR combination. The sub_sensor field distinguishes Principal ATMs from Subordinate ATMs: IF sub_sensor == NULL_SENSOR, THEN this is a Principal ATM. The fields sub_rept_pos_x, sub_rept_pos_y, and sub_rep_range only have meaning in Subordinate ATMs.

Table 16.3.5.1.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUMMSGL	1	Y
3	Reported Altitude - Corrected	rep_alt	Scaled	Feet	-1000..99900	1/8	N
4	Time of Last Correlation (zulu msecs)	last_coorel	Int	msec	0..86399999	1	N
5	Track Reported X Coord	rept_pos_x	Scaled	NM	-256..256	1/128	N
6	Track Reported Y Coord	rept_pos_y	Scaled	NM	-256..256	1/128	N
7	Reported Beacon Code	rbc	Int	N/A	0..07777	1	N
8	Track Number	trk_num	Int	N/A	1..TQi	1	Y
9	Principal Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
10	Radar Only Track	rdr_only_trk	Boolean	N/A	0..1	N/A	N
11	Terminate Requested	term_req	Boolean	N/A	0..1	N/A	N
12	Training Status	tng	Boolean	N/A	0..1	N/A	N
13	Unreasonable Mode C	un_modec	Boolean	N/A	0..1	N/A	N
14	Valid Altitude	valid_alt	Boolean	N/A	0..1	N/A	N
15	Pad	pad	Int	N/A	N/A	N/A	N

Table 16.3.5.1.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1350	uns16	1	31-16
2	Submessage Length	Message Length = 28 bytes	uns16	1	15-0
3	Reported Altitude - Corrected		int32	2	31-0
4	Time of Last Correlation (zulu msecs)		uns32	3	31-0
5	Track Reported X Coord		int16	4	31-16
6	Track Reported Y Coord		int16	4	15-0
7	Reported Beacon Code		uns16	5	31-16
8	Track Number		uns16	5	15-0

9	Principal Sensor Number		uns8	6	31-24
10	Radar Only Track		boolean	6	23-16
11	Terminate Requested		boolean	6	15-8
12	Training Status		boolean	6	7-0
13	Unreasonable Mode C		boolean	7	31-24
14	Valid Altitude		boolean	7	23-16
15	Pad[2]		uns8	7	15-0

16.3.5.2 NM Delete Flight Data Msg (m_nm_d_fp)

External form of the Delete Flight Data Msg (1809). This submessage is sent whenever the CP sets an FDF record to unused. It is used to inform the DP to set the corresponding FDF record to unused status.

Table 16.3.5.2.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
3	Record number in CP FDF	tp_nbr	Int	N/A	1..MAX_FDFQ	1	Y
4	Sensor number	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	1	N
5	Live/training track indicator	training	Boolean	N/A	0..1	N/A	N

Table 16.3.5.2.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1351	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	Record number in CP FDF		uns16	2	31-16
4	Sensor number		uns8	2	15-8
5	Live/training track indicator		boolean	2	7-0

16.3.5.3 NM Delete Track Msg (m_nm_dtm)

External form of the Delete Track Msg (1704). This message is sent whenever the TPS sets a track slot to unused. The Delete Track Msg is used to inform the DP and CP to set the corresponding track slot to unused status. This submessage is recorded by CDR when either the TA or TU extraction class is enabled.

Table 16.3.5.3.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUBMSGL	1	Y
3	Track Number	trk_num	Int	N/A	1..TQi	1	Y
4	Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
5	Subordinate Sensor Number	sub_sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y

Table 16.3.5.3.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1352	uns16	1	31-16
2	Submessage Length	Message Length = 8 bytes	uns16	1	15-0
3	Track Number		uns16	2	31-16
4	Sensor Number		uns8	2	15-8
5	Subordinate Sensor Number		uns8	2	7-0

16.3.5.4 NM Flight Plan Maintenance Msg (m_nm_afpm)

External Form of the Flight Plan Maintenance Msg (1800). This submessage is sent for each active associated track. It contains the current flight plan information. This submessage is transmitted each scan to permit initialization of any display within one scan. This submessage is recorded by CDR when the TA extraction class is enabled.

The Interfacility Message Types for a flight plan are as follows:

CF_NOSTATUS	0	No Interfacility Status
CF_DA	1	DA
CF_DX	2	DX
CF_DR	3	DR
CF_DT	4	DT
CF_TR	5	TR
CF_TB	6	TB
CF_DM	7	DM
CF_TU	8	TU
CF_TI	9	TI
CF_TA	10	TA
CF_FP	11	FP
CF_AM	12	AM
CF_CX	13	CX
CF_TL	14	TL
CF_TM	15	TM
CF_TN	16	TN
CF_RF	17	RF
CF_TS	18	TS
CF_TP	19	TP
CF_TZ	20	TZ
CF_VFRFP	21	VFR FP
CF_ARSAFP	22	ARSA FP
CF_MIDTU	23	Middle TU
CF_ENDTU	24	End TU
CF_EXPFP	25	Expect FP
CF_EXPTU	26	Expect TU

Table 16.3.5.4.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Flight Plan Maintenance Msg code	code	Int	code	0..xFFFF	N/A	Y
2	Flight Plan Maintenance Msg length	lgth	Int	bytes	MAFPML	1	Y
3	Assigned beacon code	abc	Int	N/A	0..07777	N/A	N
4	Active controller	act_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y

5	Auto-handoff altitude	aho_alt	Int	feet	0..995	100 ft.	N
6	Track requested altitude	alt_req	Int	feet	-99..999	100 ft.	N
7	Flight Plan assigned altitude	asg_alt	Int	feet	0..999	100 ft.	N
8	ETA/PTD in minutes since midnight	eta_ptd	Int	minutes	0..60*24-1	1	N
9	FDF Number	fdf_num	Int	N/A	1..MAX_FDFQ	N/A	N
10	Directed Handoff controller	ho_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
11	IF message number	if_msgno	Int	N/A	1..999	N/A	N
12	IF message time delta	if_msgtime_delta	Int	seconds	0..65535	1	N
13	IF TU time delta	if_tutime_delta	Int	seconds	0..65535	1	N
14	Old Primary Controller	old_pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
15	Primary controller	pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y
16	Run Down List	rund	Int	N/A	0..MAX_NUMKQ	N/A	N
17	Satellite List Azimuth	sat_list_azimuth	Int	degrees	0..359	1	N
18	Satellite List Range	sat_list_range	Int	NM	0..64	1	N
19	TCID	tcid	Int	N/A	1..999	N/A	N
20	TI/TA beacon code	tita_bcn	Int	N/A	0..07777	N/A	N
21	Track number (per sensor)	track_nbr[[MAX_SENSQ]=1]	Int	N/A	0..TQi	N/A	N
22	Track number (per sensor)	track_nbr[[MAX_SENSQ]= 15]	Int	N/A	0..TQi	N/A	N
23	Sensor link/no link indicator(per sensor)	link[[MAX_SENSQ]=1]	Boolean	N/A	0..1	N/A	N
24	Sensor real/pseudo link indicator(per sensor)	pseudo[[MAX_SENSQ]=1]	Boolean	N/A	0..1	N/A	N
25	Sensor link/no link indicator(per sensor)	link[[MAX_SENSQ]= 15]	Boolean	N/A	0..1	N/A	N
26	Sensor real/pseudo link indicator	pseudo[[MAX_SENSQ]= 15]	Boolean	N/A	0..1	N/A	N
27	Assigned beacon code status	abc_stat	Enum	N/A	0..2	N/A	N
28	ACID number of non-space chars	acid_non_space	Int	N/A	2..7	N/A	N
29	Aircraft category	ac_cat	ASCII	N/A	H/T/B/F/L	N/A	N
30	Original Aircraft category	orig_ac_cat	ASCII	N/A	H/T/B/F/L/V/U/W	N/A	N
31	Arrival/Departure/Enroute status	ade_stat	Enum	N/A	0..255	N/A	Y
32	Auto-handoff index	aho_ind	Int	N/A	-1..127	N/A	N
33	Adjacent ARTS ID	arts_id	Int	N/A	0..MAX_NO_FACIL	N/A	N
34	Aircraft type disp counter	atcc	Int	scans	0..7	1	N
35	BRITE List Nr by Geo Area	brite_list_nbr[[MAX_GEO_BRITE]=1]	Int	N/A	0..MAX_BRT_LIST	1	N
36	BRITE List Nr by Geo Area	brite_list_nbr[[MAX_GEO_BRITE]= 8]	Int	N/A	0..MAX_BRT_LIST	1	N
37	Flight plan adaptor number	fpa	Int	N/A	0..3	1	N
38	FP status controlled VFR flight	fpstatus	Enum	N/A	0..2	N/A	Y
39	Handoff Countdown	ho_cntdn	Int	N/A	0..63	N/A	N
40	Handoff status	ho_stat	Enum	N/A	0..IF_HO_2_ARTCC	N/A	Y
41	Count of DX messages received	if_dx	Int	N/A	0..IF_ITRQ	N/A	N
42	Count of attempts to send a msg	if_msgcount	Int	N/A	0..IF_MAX_RETRY	N/A	N
43	ARTCC sector handing off	if_sector	INt	N/A	0..31	N/A	N

	to						
44	ARTCC site messages are sent to	if_site	Int	N/A	0..3	N/A	N
45	IF message status	if_stat	Enum	N/A	0..24	N/A	N
46	Keyboard subset	kbd_subset	Int	N/A	1..7	N/A	N
47	Leader direction from change req	ldr_dir	Enum	N/A	0..7	N/A	N
48	Active radar subsystem	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	N/A	N
49	Track type	status_tp	Enum	N/A	0..3	N/A	N
50	Track usage status	status_ut	Enum	N/A	1..3	N/A	N
51	Tab coast out-of-range tracks	tab_or	Enum	N/A	0.2.3	N/A	N
52	Display number for VFR list	vfr_dsp_nbr	Int	N/A	1..MAX_NUMDQ	N/A	N
53	VFR fp stat	vfr_fp_stat	Enum	N/A	0..3	N/A	N
54	4 Aircraft type characters	ac_type[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
55	4 Aircraft type characters	ac_type[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
56	Track assigned altitude	alt_asg[[4]=1]	ASCII	ft	NULL 001..999	100 ft	N
57	Track assigned altitude	alt_asg[[4]= 4]	ASCII	ft	NULL 001..999	100 ft	N
58	Symbol and Subset of ART-ART UHO	art2art_uho[[2]= 1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
59	Symbol and Subset of ART-ART UHO	art2art_uho[[2]= 2]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
60	ARTS to ARTS symbol	atoa_sym	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
61	Airport and SS entry fixes	entry_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
62	Airport and SS entry fixes	entry_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
63	Airport and SS exit fixes	exit_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
64	Airport and SS exit fixes	exit_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
65	Exit Fix characters	exitfix_char[[MAX_AREA_LEVELS]=1]	ASCII	N/A	'A'-'Z'	N/A	N
66	Exit Fix characters	exitfix_char[[MAX_AREA_LEVELS]= 10]	ASCII	N/A	'A'-'Z'	N/A	N
67	8 Aircraft ID characters	fid[[8]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
68	8 Aircraft ID characters	fid[[8]= 8]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
69	Fix Pair Scratch Pad	fixpair_scratpad[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
70	Fix Pair Scratch Pad	fixpair_scratpad[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
71	ECID (ddA)	if_ecid[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
72	ECID (ddA)	if_ecid[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
73	TCID of other ARTS site	if_tcid[[3]=1]	ASCII	N/A	'0'-'9'	N/A	N
74	TCID of other ARTS site	if_tcid[[3]= 3]	ASCII	N/A	'0'-'9'	N/A	N
75	Keyboard symbol	kybdsymb	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
76	Satellite airport symbol	sat_apt	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
77	Scratch Pad 1 Characters	scratch_pad[[3]= 1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
78	Scratch Pad 1 Characters	scratch_pad[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
79	Scratch Pad 2 Characters	scratch_pad2[[3] =1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
80	Scratch Pad 2 Characters	scratch_pad2[[3] = 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
81	Site adapted alpha character	sitechar	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
82	Tabular line identifier	tablinid	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	Y
83	VFR FP Tab Line Identifier	vfrfp_linid	ASCII	N/A	'0'-'9' space	N/A	N

84	Auto-acquire flag	aa	Boolean	N/A	0..1	N/A	N
85	Assigned Altitude flag	asng_alt	Boolean	N/A	0..1	N/A	N
86	BRITE eligibility indicator	brite_eligib	Boolean	N/A	0..1	N/A	N
87	Inhibit CA single trk ind	cai_inh_proc	Boolean	N/A	0..1	N/A	N
88	Inhibt CA ind for trk pair	cai_pair	Boolean	N/A	0..1	N/A	N
89	VFR beacon code inhib indicator	cai_vfr_rbc	Boolean	N/A	0..1	N/A	N
90	CA inhibit zone suppress	cai_zone_sup	Boolean	N/A	0..1	N/A	N
91	Scratch pad change for CTAS	chg_scratpad	Boolean	N/A	0..1	N/A	N
92	CA alert display indicator	disp_ca	Boolean	N/A	0..1	N/A	N
93	MSAW Climb indicator	disp_climb	Boolean	N/A	0..1	N/A	N
94	Display DB indicator	disp_db	Boolean	N/A	0..1	N/A	N
95	Display DM indicator	disp_dm	Boolean	N/A	0..1	N/A	N
96	Display/retain FDB indicator	disp_fdb	Boolean	N/A	0..1	N/A	N
97	Display blinking FP indicator	disp_fp	Boolean	N/A	0..1	N/A	N
98	Display blinking IF indicator	disp_if	Boolean	N/A	0..1	N/A	N
99	MSAW warning indictor	disp_la	Boolean	N/A	0..1	N/A	N
100	Display interfacility NAT ind	disp_nat	Boolean	N/A	0..1	N/A	N
101	Display OLD indicator	disp_old	Boolean	N/A	0..1	N/A	N
102	Display Pointout indicator	disp_po	Boolean	N/A	0..1	N/A	N
103	Emer/radio fail/hijack indicator	em	Boolean	N/A	0..1	N/A	N
104	Exit Fix is Primary Airport ind	exitfix_is_pri_ap t	Boolean	N/A	0..1	N/A	N
105	Flashing ABC indicator	flash_abc	Boolean	N/A	0..1	N/A	N
106	Forced control change	force_ctl_chg	Boolean	N/A	0..1	N/A	N
107	Freeze full data block indicator	frz_fdb	Boolean	N/A	0..1	N/A	N
108	Global leader dir ind F7 L dd	global_ldr	Boolean	N/A	0..1	N/A	N
109	Heavy aircraft indicator	heavy	Boolean	N/A	0..1	N/A	N
110	Interfacility handoff complete	ho_comp	Boolean	N/A	0..1	N/A	N
111	Inhibit auto acquisition	iaa	Boolean	N/A	0..1	N/A	N
112	Interfacility late hand-off ind	iaf_lho	Boolean	N/A	0..1	N/A	N
113	IF ARSA Indicator	if_arsa	Boolean	N/A	0..1	N/A	N
114	IF AHO inhibited (delta) flag	if_delta	Boolean	N/A	0..1	N/A	N
115	IF late handoff indicator	if_lho	Boolean	N/A	0..1	N/A	N
116	Inhibit a/c type indicatr	inhactyp	Boolean	N/A	0..1	N/A	N
117	Inhibit Mode C altitude	inhmodec	Boolean	N/A	0..1	N/A	N
118	Inhibit AMB indicator	inh_amb	Boolean	N/A	0..1	N/A	N
119	Inhibit blinking HO	inh_bho	Boolean	N/A	0..1	N/A	N
120	Inhibit auto-handoff	inh_ifaho	Boolean	N/A	0..1	N/A	N
121	Display intrafacility NAT ind	intra_nat	Boolean	N/A	0..1	N/A	N
122	MSAW alert display indicator	lai_inh_disp	Boolean	N/A	0..1	N/A	N
123	Inhibit MSAW processing ind	lai_inh_proc	Boolean	N/A	0..1	N/A	N

124	Leader Direction Change Request	ldr_dir_chg	Boolean	N/A	0..1	N/A	N
125	Out of range indicator	outofrng	Boolean	N/A	0..1	N/A	N
126	Radar only flight plan indicator	rdr_only	Boolean	N/A	0..1	N/A	N
127	Ring remote MSAW alarm	remote_alarm	Boolean	N/A	0..1	N/A	N
128	MSAW alarm indicator	ring_msaw	Boolean	N/A	0..1	N/A	N
129	Satellite List Entry	sat_list_entry	Boolean	N/A	0..1	N/A	N
130	Suspend out-of-range indicator	sdor	Boolean	N/A	0..1	N/A	N
131	Unused	unused3	Boolean	N/A	0..1	N/A	N
132	Track active status	status_a	Boolean	N/A	0..1	N/A	N
133	Suspend trk trk/not trk	susp_trk_not_trk	Boolean	N/A	0..1	N/A	N
134	Suspend track special symbol	sus_trk_sym	Boolean	N/A	0..1	N/A	N
135	TA beacon code received	taval	Boolean	N/A	0..1	N/A	N
136	TI beacon code received	tival	Boolean	N/A	0..1	N/A	N
137	Live/training track indicator	tng	Boolean	N/A	0..1	N/A	N
138	VFR Fix intermediate flag	vfrfp_fixint	Boolean	N/A	0..1	N/A	N
139	VFR fp originated at ARTS	vfr_arts	Boolean	N/A	0..1	N/A	N
140	VFR flight plan	vfr_fp	Boolean	N/A	0..1	N/A	N
141	Zone/floor suppress indicator	zone_sup	Boolean	N/A	0..1	N/A	N

Table 16.3.5.4.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Flight Plan Maintenance Msg code	Message Code = 1353	uns16	1	31-16
2	Flight Plan Maintenance Msg length	Message Length = 248 bytes	uns16	1	15-0
3	Assigned beacon code		uns16	2	31-16
4	Active controller		uns16	2	15-0
5	Auto-handoff altitude		uns16	3	31-16
6	Track requested altitude		int16	3	15-0
7	Flight Plan assigned altitude		int16	4	31-16
8	ETA/PTD in minutes since midnight		uns16	4	15-0
9	FDF Number		uns16	5	31-16
10	Directed Handoff controller		uns16	5	15-0
11	IF message number		uns16	6	31-16
12	IF message time delta	(seconds)	uns16	6	15-0
13	IF TU time delta	(seconds)	uns16	7	31-16
14	Old Primary Controller		uns16	7	15-0
15	Primary controller		uns16	8	31-16
16	Run Down List		uns16	8	15-0
17	Satellite List Azimuth	from airport	uns16	9	31-16
18	Satellite List Range	from airport	uns16	9	15-0
19	TCID		uns16	10	31-16
20	TI/TA beacon code		uns16	10	15-0
21	Track number (per sensor)		uns16	11	31-16
22	Track number (per sensor)		uns16	18	31-16
23	Sensor link/no link indicator	These [Fields = 2] are repeated [[MAX_SENSQ] =1] times	boolean	18	15-8
24	Sensor real/pseudo link indicator		boolean	18	7-0
25	Sensor link/no link indicator	These [Fields = 2] are repeated [[MAX_SENSQ] = 15] times	boolean	25	15-8
26	Sensor real/pseudo link indicator		boolean	25	7-0
27	Assigned beacon code status	ABC_EXISTS(0)=assigned TENT_ABC(1)=tentative assigned NO_ABC(2)=no assigned	uns8	26	31-24
28	ACID number of non-space chars		uns8	26	23-16
29	Aircraft category		uns8	26	15-8
30	Original Aircraft category		uns8	26	7-0
31	Arrival/Departure/Enroute status	Must be ADE_OVERFLIGHT or ADE_ARR_UNKNOWN..ADE_ARRU or ADE_DEP_UNKNOWN..ADEPU	uns8	27	31-24
32	Auto-handoff index		int8	27	23-16
33	Adjacent ARTS ID		uns8	27	15-8
34	Aircraft type disp counter		uns8	27	7-0
35	BRITE List Nr by Geo Area		uns8	28	31-24
36	BRITE List Nr by Geo Area		uns8	29	7-0

37	Flight plan adaptor number		uns8	30	31-24
38	FP status controlled VFR flight	0 = IFR1 = VFR2 = VFR_ON_TOP	uns8	30	23-16
39	Handoff Countdown		uns8	30	15-8
40	Handoff status	0=not in handoff 1=intrafacility countdown 2=interfacility countdown 3=intrafacility 4=to ARTCC 5=from ARTCC	uns8	30	7-0
41	Count of DX messages received		uns8	31	31-24
42	Count of attempts to send a msg		uns8	31	23-16
43	ARTCC sector handing off to		uns8	31	15-8
44	ARTCC site messages are sent to		uns8	31	7-0
45	IF message status	See text	uns8	32	31-24
46	Keyboard subset		uns8	32	23-16
47	Leader direction from change req	LDR_N(0)=North LDR_NE(1)=Northeast LDR_E(2)=EastLDR_SE(3)=Southeast LDR_S(4)=South LDR_SW(5)=Southwest LDR_W(6)=WestLDR_NW(7)=Northwest	uns8	32	15-8
48	Active radar subsystem		uns8	32	7-0
49	Track type	0=store 1=tab coast 2=suspend not tracking 3=suspend	uns8	33	31-24
50	Track usage status	ASSOCIATED(1)=associated UNASSOCIATED(3)=unassociated	uns8	33	23-16
51	Tab coast out-of-range tracks	0=not OR 2=OR 3=blinking OR	uns8	33	15-8
52	Display number for VFR list		uns8	33	7-0
53	VFR fp stat	0=VFR 1=FIX 2=IFP	uns8	34	31-24
54	4 Aircraft type characters		char	34	23-16
55	4 Aircraft type characters		char	35	31-24
56	Track assigned altitude		char	35	23-16
57	Track assigned altitude		char	36	31-24
58	Symbol and Subset of ART-ART UHO		char	36	23-16
59	Symbol and Subset of ART-ART UHO		char	36	15-8
60	ARTS to ARTS symbol		char	36	7-0
61	Airport and SS entry fixes		char	37	31-24
62	Airport and SS entry fixes		char	37	7-0
63	Airport and SS exit fixes		char	38	31-24
64	Airport and SS exit fixes		char	38	7-0
65	Exit Fix characters		char	39	31-24
66	Exit Fix characters		char	41	23-16
67	8 Aircraft ID characters		char	41	15-8
68	8 Aircraft ID characters		char	43	23-16
69	Fix Pair Scratch Pad		char	43	15-8
70	Fix Pair Scratch Pad		char	44	31-24
71	ECID (ddA)		char	44	23-16

72	ECID (ddA)		char	44	7-0
73	TCID of other ARTS site		char	45	31-24
74	TCID of other ARTS site		char	45	15-8
75	Keyboard symbol		char	45	7-0
76	Satellite airport symbol		char	46	31-24
77	Scratch Pad 1 Characters		char	46	23-16
78	Scratch Pad 1 Characters		char	46	7-0
79	Scratch Pad 2 Characters		char	47	31-24
80	Scratch Pad 2 Characters		char	47	15-8
81	Site adapted alpha character		char	47	7-0
82	Tabular line identifier		char	48	31-24
83	VFR FP Tab Line Identifier		char	48	23-16
84	Auto-acquire flag		boolean	48	15-8
85	Assigned Altitude flag		boolean	48	7-0
86	BRITE eligibility indicator		boolean	49	31-24
87	Inhibit CA single trk ind		boolean	49	23-16
88	Inhibt CA ind for trk pair		boolean	49	15-8
89	VFR beacon code inhib indicator		boolean	49	7-0
90	CA inhibit zone suppress		boolean	50	31-24
91	Scratch pad change for CTAS		boolean	50	23-16
92	CA alert display indicator		boolean	50	15-8
93	MSAW Climb indicator		boolean	50	7-0
93	Display DB indicator		boolean	51	31-24
95	Display DM indicator		boolean	51	23-16
96	Display/retain FDB indicator		boolean	51	15-8
97	Display blinking FP indicator		boolean	51	7-0
98	Display blinking IF indicator		boolean	52	31-24
99	MSAW warning indictor		boolean	52	23-16
100	Display interfacility NAT ind		boolean	52	15-8
101	Display OLD indicator		boolean	52	7-0
102	Display Pointout indicator		boolean	53	31-24
103	Emer/radio fail/hijack indicator		boolean	53	23-16
104	Exit Fix is Primary Airport ind		boolean	53	15-8
105	Flashing ABC indicator		boolean	53	7-0
106	Forced control change		boolean	54	31-24
107	Freeze full data block indicator		boolean	54	23-16
108	Global leader dir ind F7 L dd		boolean	54	15-8
109	Heavy aircraft indicator		boolean	54	7-0
110	Interfacility handoff complete		boolean	55	31-24
111	Inhibit auto acquisition		boolean	55	23-16
112	Interfacility late hand-off ind		boolean	55	15-8

113	IF ARSA Indicator		boolean	55	7-0
114	IF AHO inhibited (delta) flag		boolean	56	31-24
115	IF late handoff indicator		boolean	56	23-16
116	Inhibit a/c type indicatr		boolean	56	15-8
117	Inhibit Mode C altitude		boolean	56	7-0
118	Inhibit AMB indicator		boolean	57	31-24
119	Inhibit blinking HO		boolean	57	23-16
120	Inhibit auto-handoff		boolean	57	15-8
121	Display intrafacility NAT ind		boolean	57	7-0
122	MSAW alert display indicator		boolean	58	31-24
123	Inhibit MSAW processing ind		boolean	58	23-16
124	Leader Direction Change Request		boolean	58	15-8
125	Out of range indicator		boolean	58	7-0
126	Radar only flight plan indicator		boolean	59	31-24
127	Ring remote MSAW alarm		boolean	59	23-16
128	MSAW alarm indicator		boolean	59	15-8
129	Satellite List Entry		boolean	59	7-0
130	Suspend out-of-range indicator		boolean	60	31-24
131	Unused3		boolean	60	23-16
132	Track active status		boolean	60	15-8
133	Suspend trk trk/not trk		boolean	60	7-0
134	Suspend track special symbol		boolean	61	31-24
135	TA beacon code received		boolean	61	23-16
136	TI beacon code received		boolean	61	15-8
137	Live/training track indicator		boolean	61	7-0
138	VFR Fix intermediate flag		boolean	62	31-24
139	VFR fp originated at ARTS		boolean	62	23-16
140	VFR flight plan		boolean	62	15-8
141	Zone/floor suppress indicator		boolean	62	7-0

16.3.5.5 NM CTIS Heartbeat Msg (m_nm_ctis_hbeat)

External form of the CTIS Heartbeat Msg (1301). This submessage is sent by the Common Terminal Interface (CTIS) CSCI once per second. It contains the current status of the interface to the Noise Monitor system. This message is used by the Noise Monitor PC to determine which of the redundant AGWs is active.

The CTIS State contains one of the following values:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

Table 16.3.5.5.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	Current System Time within day	system_time	Int	msec	0.. 86399999	1	Y
4	Day of Year	day_of_year	Int	N/A	1..366	N/A	Y
5	Last two digits of year	year	Int	N/A	00..99	N/A	Y
6	CTIS State (see text)	fast_state	enum	N/A	0..3	N/A	N
7	Pad msg to multiple of 32 bits	pad[3]	char	N/A	N/A	N/A	N

Table 16.3.5.5.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1354	uns16	1	31-16
2	Submessage length	Message Length = 16 bytes	uns16	1	15-0
3	Current System Time within day		uns32	2	31-0
4	Day of Year		uns16	3	31-16
5	Last two digits of year		uns16	3	15-0
6	CTIS State (see text)		uns8	4	31-24
7	Pad msg to multiple of 32 bits		uns8	4	23-0

16.3.5.6 NM PC Heartbeat Msg (m_nm_hbeat)

This submessage is sent to the AGW once per second by the Noise Monitor PC. The CTIS CSCI will process this message to determine the presence of the Noise Monitor PC and the condition of the interconnecting network link. The contents of this message are identical to those in the CTIS Heartbeat Message.

The NM State field contains one of the following values representing the state of the Noise Monitor PC:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

Table 16.3.5.6.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	NM State (see text)	nm_state	Enum	N/A	0..3	N/A	N
4	Pad msg to multiple of 32 bits	pad[[1]=3]	char	N/A	N/A	N/A	N

Table 16.3.5.6.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1355	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	NM State (see text)		uns8	2	31-24
4	Pad msg to multiple of 32 bits		uns8	2	23-0

Section 17
LOCAL R-ACD INTERFACE

17.1 GENERAL DESCRIPTION

The ARTS IIIE and the local tower R-ACD display is interfaced to the ARTS networks within the facility. Figure 17-1 illustrates the network interface and the Minimum Safe Altitude Warning (MSAW) alarm to the Local Tower R-ACD for the ARTS IIIE configuration. The 1 to 5 video splitter allows for up to five monitors in the Tower Cab connected to the same R-ACD. Figure 17-2 illustrates a Dual Local Tower R-ACD system configuration for Common ARTS.

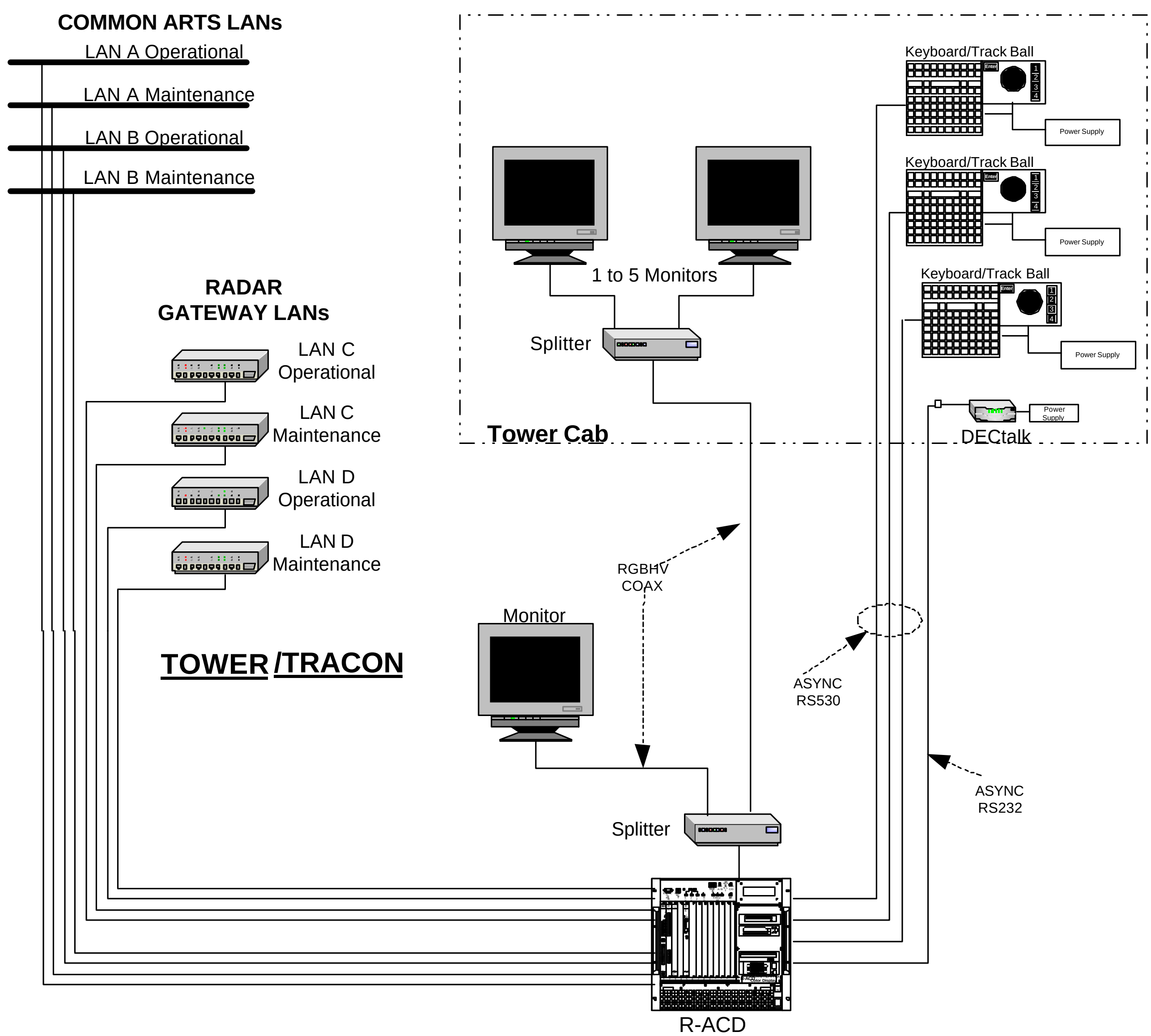


FIGURE 17-1. ARTS IIIE LOCAL TOWER R-ACD DIAGRAM

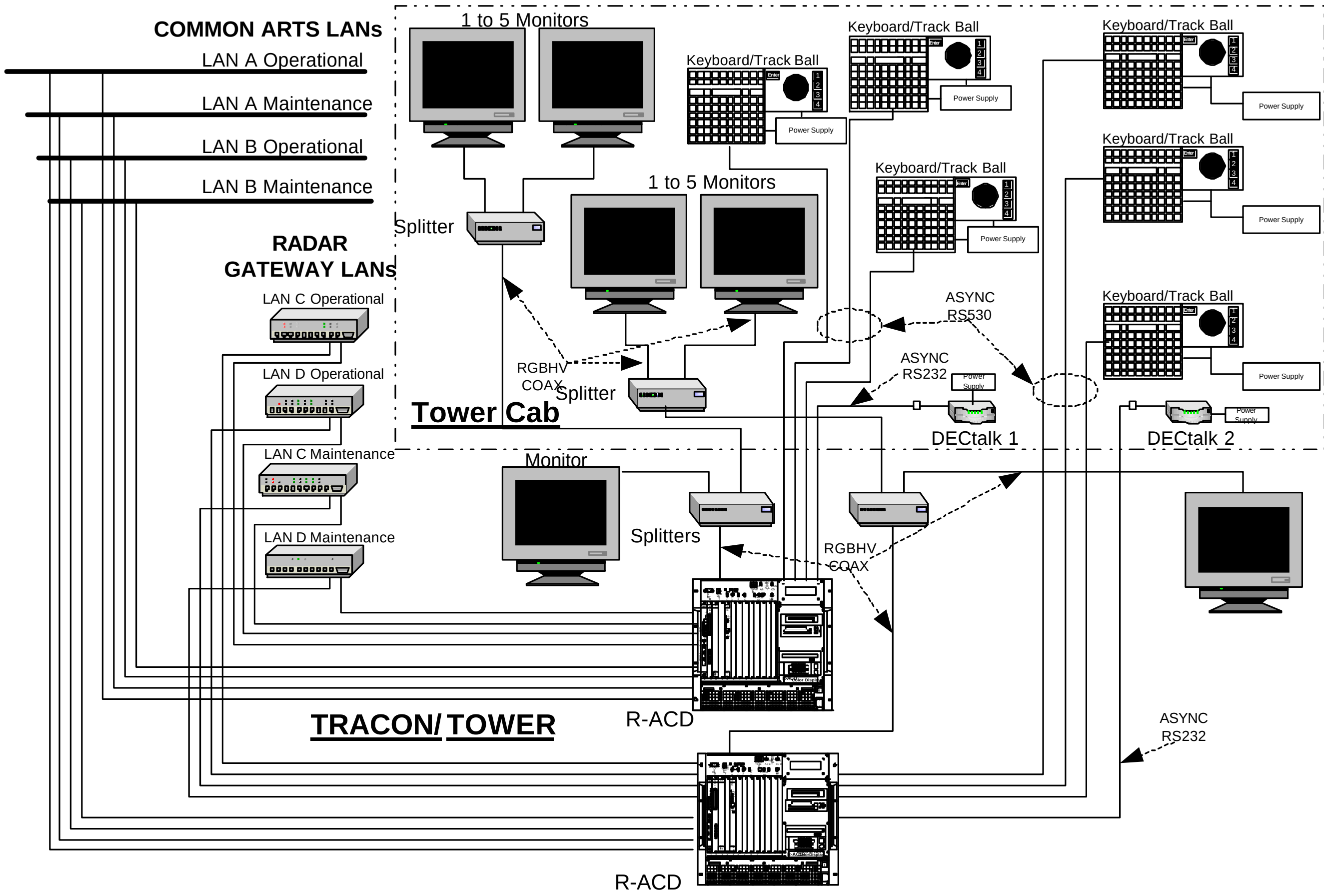


FIGURE 17-2. DUAL ARTS IIIE LOCAL TOWER R-ACD DIAGRAM

17.2 REFERENCED DOCUMENTS

17.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

17.2.1.1 Applicable Government Documents

Specifications

NAS-MD-639	ARTS Computer Program Functional Specification (CPFS) Display Output Processing and Converging Runway Display Aid (CRDA) A5.05/A2.09 dated March 1999

Standards

None.

Other Publications

None.

17.2.1.2 Applicable Non-Government Documents

Standards

EIA-RS-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Exchange
EIA-RS-422-A	Electrical Characteristics of Balanced Voltage Digital Interface Circuits, December 1978
EIA-TIA-530-A	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Including Alternative 26-Position Connector (ANSI/TIA-530-A-92), June 1992

Other Publications

ATC 100088	Remote-ACD technical manual
ATC 100060	Product Specification/Remote ACD (CDRL 020)

17.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-99-C-00045	Modification 0015 Remote ARTS color Display June 16, 1999

FAA Specifications

None

FAA Computer Program Functional Specifications

NAS-MD-639.

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

17.3 LOCAL ARTS IIIE TOWER REMOTE ACD INTERFACE DESCRIPTION

17.3.1 General Information

There are no external interfaces between ARTS IIIE and Local Tower R-ACD, except for the video interface to the monitors. All control and display capability are via the Common ARTS IIIE LANs. This provides an alphanumeric (A/N) presentation with the same information available to the normal ACD in a TRACON. The equipment generates all the alphanumeric signals and displays the radar picture. Data entry is accomplished through the use of a A/N keyboard/track ball assemblies.

17.3.2 Mechanical Characteristics

The BNC Video Splitter built by Network Technologies Incorporated (NTI) provides the five outputs required. The sixth output is unused. The input of the 1 to video splitter is connected to the output of the 1 to 2 BNC Video Splitters and located in the R-ACD equipment rack. Figure 17-3 illustrates the connection for the 1 to 5 BNC Video Splitter. Figure 17-4 illustrates the connection for the 1 to 2 BNC Video Splitter

17.3.3 Electrical Characteristics

17.3.3.1 Video Input

The BNC Video Splitter has one set of input BNC connectors. Connector characteristics are defined in TABLE 17-1. The BNC video Splitter output connector signals are listed in TABLE 17-2.

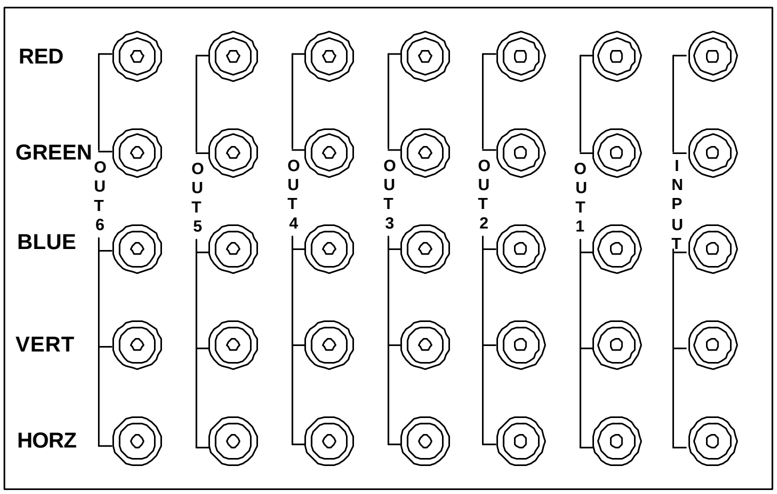


FIGURE 17-3. 1 to 5 BNC VIDEO SPLITTER CONNECTOR PANEL

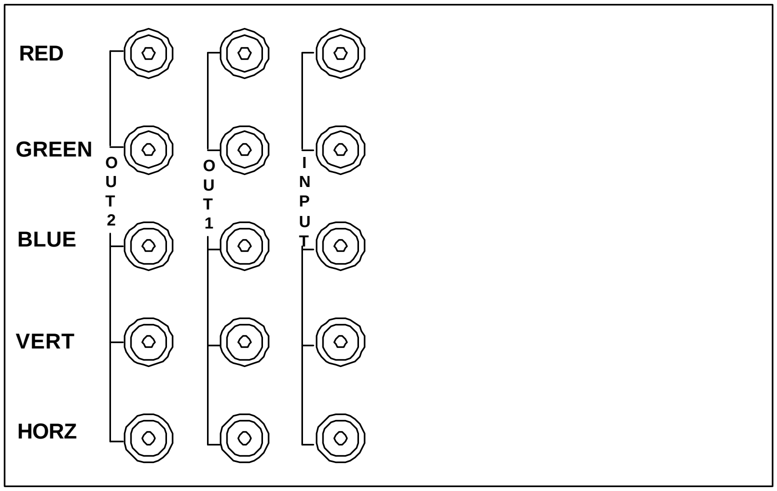


FIGURE 17-4. 1 to 2 BNC VIDEO SPLITTER CONNECTOR PANEL

TABLE 17-1 VIDEO SPLITTER INPUT CABLE PIN DEFEINITION

SIGNAL	CONNECTOR	CONNECTOR TYPE	IMPEDENCE (ohms) ±1 %	SIGNAL STRENGTH (Volts) ±10 %
RED	BNC	FEMALE	75	1v p-p
GREEN	BNC	FEMALE	75	1v p-p
BLUE	BNC	FEMALE	75	1v p-p
HORIZONTA	BNC	FEMALE	2000	1v p-p
VERTICAL	BNC	FEMALE	2000	1v p-p

TABLE 17-2. VIDEO SPLITTER OUTPUT CABLE PIN DEFEINITION

SIGNAL	CONNECTOR	CONNECTOR TYPE	IMPEDANCE (ohms) ±1 %	SIGNAL Delay μsec	SIGNAL STRENGTH (Volts) ±10 %
RED	BNC	FEMALE	75	<20	1v p-p
GREEN	BNC	FEMALE	75	<20	1v p-p
BLUE	BNC	FEMALE	75	<20	1v p-p
HORIZONTA	BNC	FEMALE	2000	<20	1v p-p
VERTICAL	BNC	FEMALE	2000	<20	1v p-p

17.3.3.3 Signal

Video splitters electrical signals have an approximate delay of less than 20 microseconds and a 1-volt peak to peak level.

17.3.3.4 Minimum Safe Altitude Warning Alarm Interface

The message to sound the MSAW aural alarm is generated by the software and will enable the DECTalk audio alarm driven by the R-ACD. A full description of the alarm generation is describe in NAS-MD-639.

Section 18
REMOTE ARTS COLOR DISPLAY (R-ACD) INTERFACE

18.1 GENERAL DESCRIPTION

The Remote ACD has an external interface between the ARTS IIIE TRACON and the R-ACD Tower equipment. Figure 18-1 illustrates the Remote Display Multiplexer (RDM) interface to the R-ACD subsystem. The RDM uses a serial interface that conforms to TIA-530 connected to the GFE telecommunications equipment. The data is transmitted to the Tower R-ACD via a GFE communications link. At the Tower the data is fed to the R-ACD from the GFE telecommunications equipment. The other external interface in from the video splitters. The video splitters are located in the tower equipment room and in the Tower Cab. Figure 18-2 illustrated a dual R-ACD tower system.

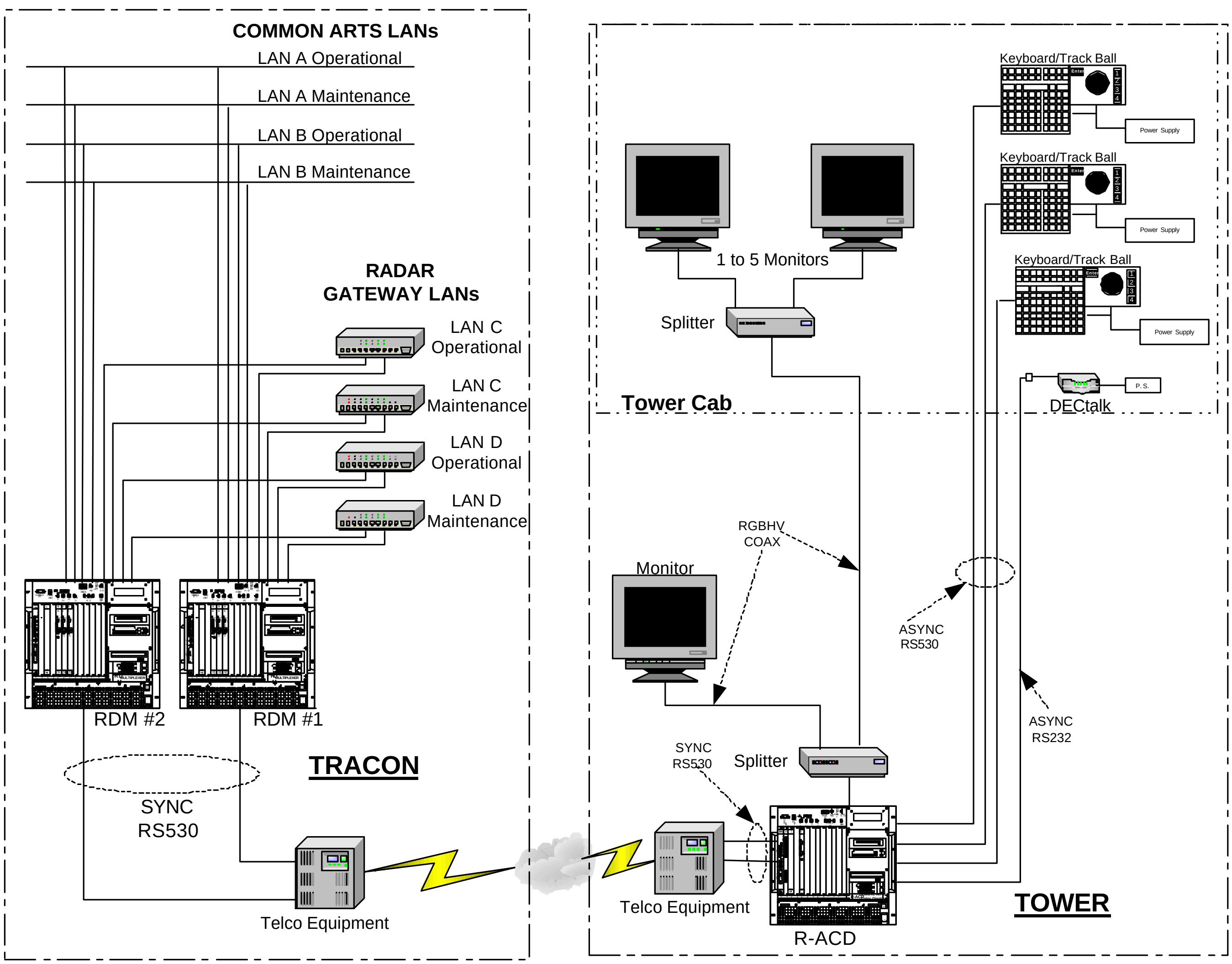


FIGURE 18-1. REMOTE ACD SINGLE SYSTEM DIAGRAM

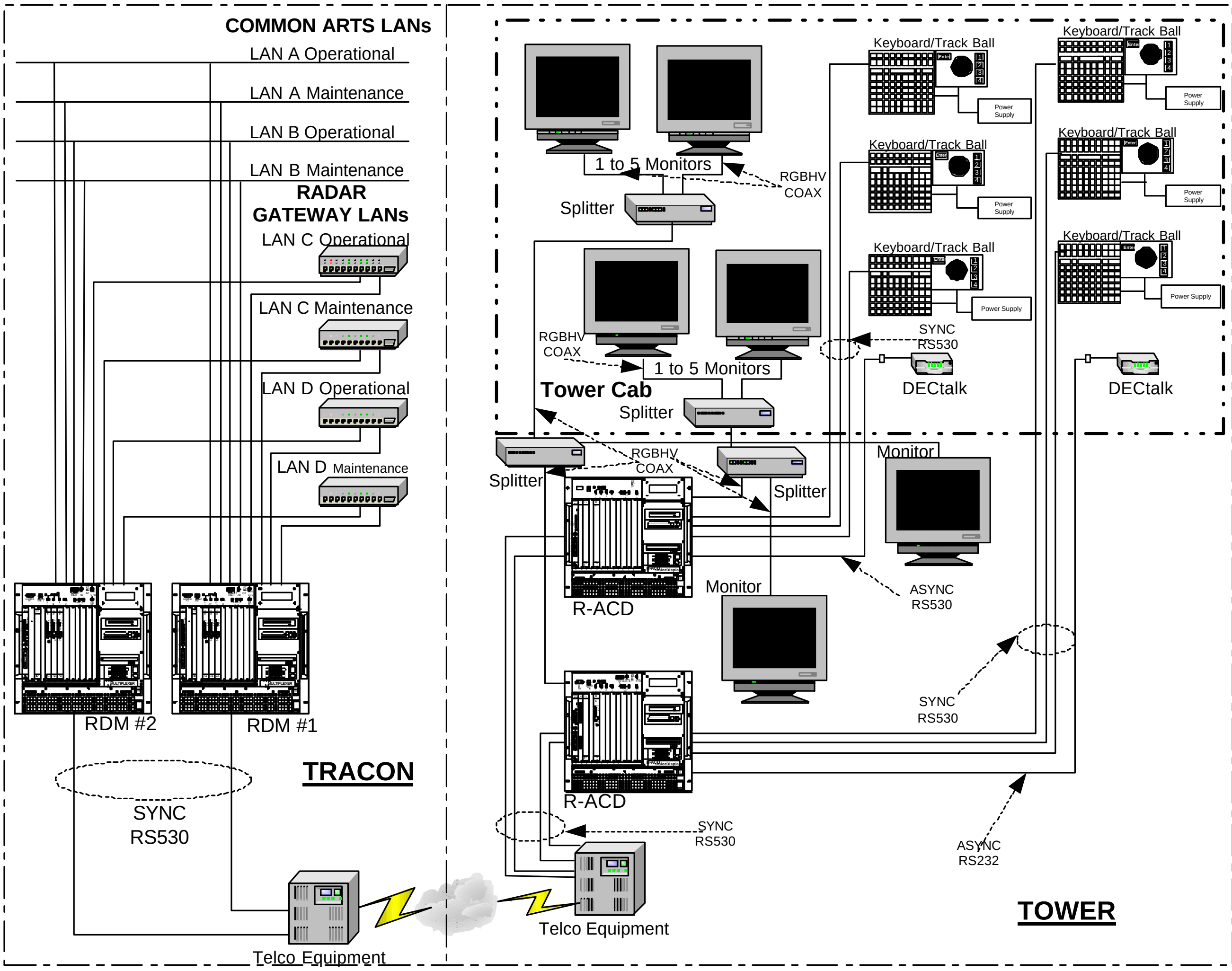


FIGURE 18-2. REMOTE ACD DUAL SYSTEM DIAGRAM

18.2 REFERENCED DOCUMENTS

18.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

18.2.1.1 Applicable Government Documents

Specifications

NAS-MD-639	ARTS Computer Program Functional Specification (CPFS) Display Output Processing and Converging Runway Display Aid (CRDA) A5.05/A2.09 dated March 1999

Standards

None.

Other Publications

None.

18.2.1.2 Applicable Non-Government Documents

Standards

EIA-RS-232-C	Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Exchange
EIA-RS-422-A	Electrical Characteristics of Balanced Voltage Digital Interface Circuits, December 1978
EIA-TIA-530-A	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment Including Alternative 26-Position Connector (ANSI/TIA-530-A-92), June 1992

Other Publications

ATC 100093	Remote Display Multiplexer Instruction Book
ATC 100060	Product Specification Remote ACD/ACD (CDRL 020)
ATC 100094	Remote Display Multiplexer Product Specification
ATC 100088	Remote ARTS Color Display Instruction Book

18.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

DTFA01-99-C-00045	Modification 0015 Remote ARTS color Display June 16, 1999

FAA Specifications

None

FAA Computer Program Functional Specifications

None.

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

18.3 INTERFACE DESCRIPTION

18.3.1 General Information

The RDM connects up to 24 R-ACDs or RDBM/DRITEs to the ARTS IIIE system at remote towers. The RDM updates air traffic control information in the R-ACD with data received from the Common ARTS automation system via this communication links. Keyboard and Trackball information from the R-ACD are accepted by the RDM for transmission to the ARTS IIIE system. The RDM is linked to the R-ACD by GFE modems and telephone lines.

18.3.2 Mechanical Characteristics

18.3.2.1 Telecommunication Interface

The modem connects directly to the top hat of the RDM equipment rack in the TRACON. Figure 18-3 is the illustration of the typical telecommunication interface cabling for the RDM at the TRACON. Figure 18-4 is the typical telecommunication interface cabling for the R-ACD equipment in the tower. The RDM EIA/TIA-530A interconnections are shown in Table 18-1.

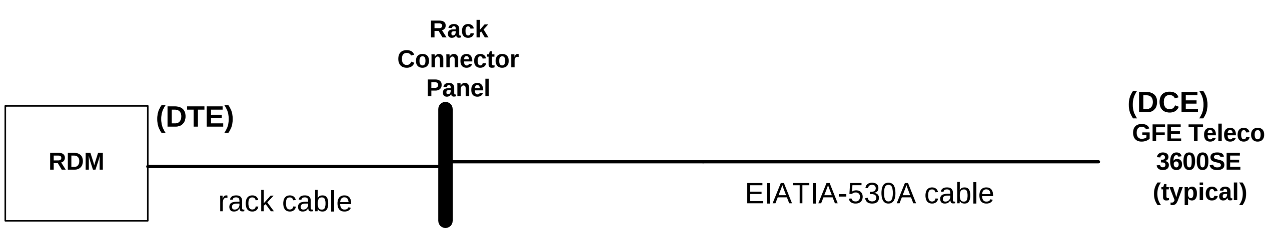


FIGURE 18-3. TYPICAL INTERNAL/EXTERNAL MODEM CABLING

FIGURE 18-4. TYPICAL INTERNAL/EXTERNAL MODEM CABLING AT THE R-ACD

TABLE 18-1. RDM OR R-ACD TOP HAT TO TELCO EQUIPMENT EIA/TIA-530-A CONNECTIONS

RDM or R-ACD Top Hat CONNECTOR (DTE)	SIGNAL NAME	MNEMONIC	SOURCE	Telco equipment Connector (DCE) PIN
1	Shield	-	-	1
2	Transmitted Data	BA(A)	DTE	2
14	Transmitted Data	BA(B)	DTE	14
3	Received Data	BB(A)	DCE	3
16	Received Data	BB(B)	DCE	16
4	Request to Send	CA(A)	DTE	4
19	Request to Send	CA(B)	DTE	19
5	Clear to Send	CB(A)	DCE	5
13	Clear to Send	CB(B)	DCE	13
6	DCE Ready (DSR)	CC(A)	DCE	6
22	DCE Ready (DSR)	CC(B)	DCE	22
7	Signal Ground	AB	-	7
8	Receive Line Signal Detect (DCD)	CF(A)	DCE	8
10	Receive Line Signal Detect (DCD)	CF(B)	DCE	10
9	Receive Signal Element Timing	DD(B)	DCE	9
17	Receive Signal Element Timing	DD(A)	DCE	17
11	Transmit Signal Element Timing	DA(B)	DTE	11
24	Transmit Signal Element Timing	DA(A)	DTE	24
12	Transmit Signal Element Timing	DB(B)	DCE	12
15	Transmit Signal Element Timing	DB(A)	DCE	15
20	DTE Ready (DTR)	CD(A)	DTE	20
23	DTE Ready (DTR)	CD(B)	DTE	23
18	Local Loopback	LL	DTE	18
21	Remote Loopback	RL	DTE	21
25	Test Mode	TM	DCE	25

EIA/TIA-530A is based on a 25 pin connection. It works in conjunction with either electrical interface RS-422 (balanced electrical circuits) or RS-423 (unbalanced electrical circuits). RS-530 defines the mechanical/electrical interfaces between DTEs and DCEs that transmit serial binary data, whether synchronous or asynchronous. EIA/TIA-530A provides a means for taking advantage of higher data rates with the same mechanical connector used for RS-232. However, RS-530 and RS-232 are not compatible.

18.3.3 Electrical Characteristics

The RDM Serial Interface Controller (SIC) has eight serial channels of one, which is used as a test channel. The EIA/TIA-530A channels are compatible with the Telecommunications equipment.

The SIC signaling levels are defined in EIA-RS-422.

18.3.4 Protocol

This interface has several layers of protocol. The physical layer and the link layer are discussed herein.

18.3.4.1 Data Link Layer

The data link layer is a High level Data Link Control (HDLC) protocol is implemented in accordance with ISO/IEC-3309, ISO/IEC-4335 and ISO/IEC-7809. This protocol is implemented in a manner that will send a single data message in complete one interface channel. The HDLC protocol is further defined in ISO 7809 (addendum 1 and 2), asynchronous balanced mode with option 4(balanced Asynchronous Class – BAC – 4). These options are described in ISO 7809 Table I and ISO 7809 addendum 2, clause 5.

The HDLC protocol has a 6-byte wrapper placed around the data transmitted. This consists of header information, the data, and trailer information. The 6 bytes of data are shown in TABLE 18-2 HDLC Protocol. This is in accordance with the Framing structure in ISO 3309 paragraph 3.

TABLE 18-2. HDLC PROTOCOL

FLAG (8 bits 1 byte)	**ADDRESS** (8 bits 1 byte)	**CONTROL** (8 bits 1 byte)	**INFORMATION** (0 to N bytes)	**FCS** (16 bits 2 byte)	**FLAG** (8 bits 1 byte)
Start- of Frame Delimiter	Frame Header		Information Field	Frame Check Sequence	End-of-Frame Delimiter

The HDLC protocol and features provides the following:

- Provides for error detection
- Enables a transparent flow of data
- Provides for synchronous data transmission
- Automatic zero insertion and deletion
- Automatic flag insertion between messages
- Cyclic redundancy check generation and detection
- Abort sequence generation and checking

18.3.4.2 Physical Layer

The physical layer will be in accordance with the functional requirements of EIA/TIA-530A. The automation system will operate as Data Terminal Equipment (DTE). The Government provided transmission equipment (TE) shall operate as Data Circuit Terminating Equipment (DCE). The Terminal surveillance system shall operate as a DCE when collocated with the AUTOMATION system and as a DTE when connected to the TE.

Signals from the surveillance system or surveillance system modems to the track processors or ARTS Radar Gateway are as described in Table 18-1.

18.3.5 Data Formats

The messages send to and form the RDM are defined in the NASA-MD-639.

18.3.6 Video Input

The BNC Video Splitter has one set of input BNC connectors. Connector characteristics are defined in TABLE 18-3. The BNC video Splitter output connector signals are listed in TABLE 18-4.

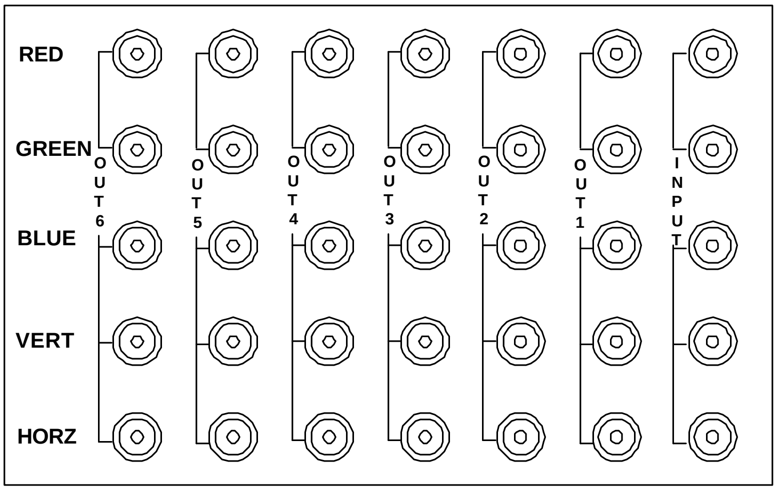


FIGURE 18-5. 1 TO 5 BNC VIDEO SPLITTER CONNECTOR PANEL

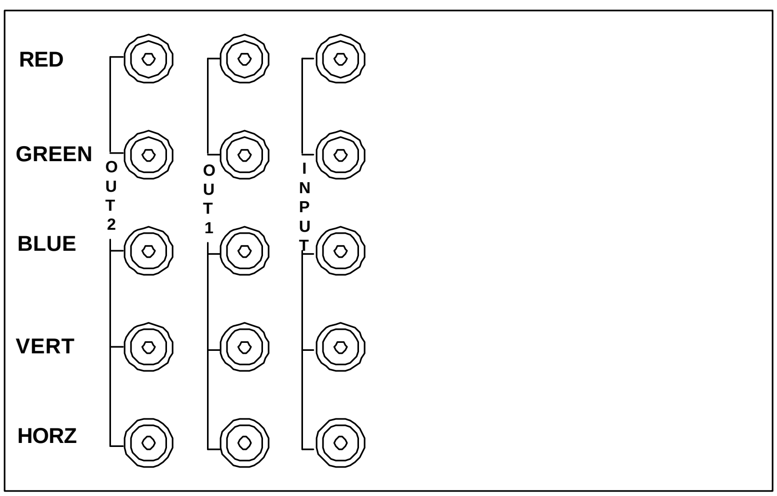


FIGURE 18-6. 1 TO 2 BNC VIDEO SPLITTER CONNECTOR PANEL

TABLE 18-3. VIDEO SPLITTER INPUT CABLE PIN DEFINITION

SIGNAL	CONNECTOR	CONNECTOR TYPE	IMPEDANCE (ohms) ±1 %	SIGNAL STRENGTH (Volts) ±10 %
RED	BNC	FEMALE	75	1v p-p
GREEN	BNC	FEMALE	75	1v p-p
BLUE	BNC	FEMALE	75	1v p-p
HORIZONTA	BNC	FEMALE	2000	1v p-p
VERTICAL	BNC	FEMALE	2000	1v p-p

TABLE 18-4. VIDEO SPLITTER OUTPUT CABLE PIN DEFINITION

SIGNAL	CONNECTOR	CONNECTOR TYPE	IMPEDANCE (ohms) ±1 %	SIGNAL Delay µsec	SIGNAL STRENGTH (Volts) ±10 %
RED	BNC	FEMALE	75	<20	1v p-p
GREEN	BNC	FEMALE	75	<20	1v p-p
BLUE	BNC	FEMALE	75	<20	1v p-p
HORIZONTA	BNC	FEMALE	2000	<20	1v p-p
VERTICAL	BNC	FEMALE	2000	<20	1v p-p

18.3.6.1 Signal

Video splitters electrical signals have an approximate delay of less than 20 microseconds and a 1-volt peak to peak level.

Section 19
SURFACE MOVEMENT ADVISORY INTERFACE

19.1 GENERAL DESCRIPTION

The Surface Movement Advisory Interface provides tracking and flight plan information to external data collection and analysis tools. Common ARTS provides this interface through a generic firewall capability through the use of an ARTS Interface Gateway Chassis (AGW). The AGW runs various processes to interface and convert messages between Common ARTS and other equipment and acts to isolate the external equipment from the operational local area networks. An implementation of the Common Terminal Interface Software (CTIS) is used to convert the current Common ARTS messages to an external form used by the Surface Movement Advisory system.

19.2 REFERENCED DOCUMENTS

19.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

19.2.1.1 Applicable Government Documents

Specifications

ATC 60050	Common ARTS Interface Design Document

Standards

None.

Other Publications

None.

19.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

FIPS PUB 160	American National Standard for Information Systems - Programming Language – C
ANSI/IEEE Standard 802.3 -	Institute of Electrical and Electronic Engineers-Local Area Networks International Standards Organization (ISO) Open System Interconnect (OSI) Reference Mode and ISO Communication Protocol Standards.
IETF STD-0005	Internet Protocol, September 1981
IETF STD-0007	Transmission Control Protocol, September 1981
IETF STD-0041	Standard for the transmission of IP datagrams over Ethernet networks, April 1984

Other Publications

None.

19.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993.

FAA Computer Program Functional Specifications

ARTS NAS-MD-634, A6.05/A2.09	System Description and Specified Series, Final, Rev. A, November 1997
ARTS NAS-MD-638, A6.05/A2.09	Keyboard, Final, Rev. A, November 1997
ARTS NAS-MD-639, A6.05/A2.09	Display Output Processing and Converging Runway Display Aid (CRDA), Final, Rev. A, November 1997
ARTS NAS-MD-642, A6.05/A2.09	Error and Status Messages, Final, Rev. A, November 1997
ARTS NAS-MD-643, A6.05/A2.09	Site Adaptation, Final, Rev. A, November 1997
ARTS NAS-MD-646, A6.05/A2.09	CDR Editor, RETRACK and Disk/File Utilities, Final, Rev. A, November 1997
ARTS NAS-MD-648, A6.05/A2.09	Continuous Data Recording Processing and Performance Monitoring, Final, Rev. A, November 1997

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

19.3 SURFACE MOVEMENT ADVISORY INTERFACE

19.3.1 General Information

The Common ARTS Interface to the Surface Movement Advisory Data Collection PC is through a 100 megabit per second ethernet running TCP/IP protocols. The ethernet interface in the AGW is used to communicate to the ethernet port on the SMA PC. The AGW hardware in the IIIE system is made up of two VME Chassis's connected to two independent Cisco firewalls which are then connected to a hub. The AGW hardware in the IIE system is made up of a single PC connected directly to a hub.

19.3.2 Mechanical Characteristics

The ethernet connection on either the IIIE or IIE versions of the AGW are made of a RJ45 architecture. All the external systems that wish to interface to the Common ARTS system will use a RJ45 cable over a 10/100 Mbit connection to attach their computer to the same hub as that of the AGW.

19.3.3 Electrical Characteristics

The RJ45 interface that connects to the hub conforms to the industry standard layout defined for this interface. A 100 Mbit RJ45 connection is highly recommended to minimize 10Mbit bottlenecks on the network.

The PowerPC version of the AGW is a RJ45 10/100 connection into a CISCO Firewall/Router or directly into the AGW depending on site adaptation. Normal configuration is a RJ45(Cat. 5) connection into a Switch in route to a CISCO Firewall/Router(connected to the AGW), which conforms to the industry standard RJ45 10/100 Cat 5 configuration for this interface.

The Linux i86 version of the AGW is a RJ45 10/100 connection directly into the AGW or a 10/100 Switch(sites with multiple AGW clients) which conforms to the industry standard layout for this interface.

19.3.4 Network Protocol

The Surface Movement Advisory interface to the Common ARTS system uses TCP/IP protocols. The Common Terminal Interface Software (CTIS) process running in the AGW acts as a TCP server. In order to support two separate systems two processes are utilized (sma and sma-a), they are designed to communicate on ports **5080** and **5090** respectively. All data is passed in network byte order (big endian). The IP address for this interface is set in Common ARTS Adaptation and is physically set by CTIS when the program initializes.

Messages are passed to and from the Common ARTS AGW using a simple higher level protocol running on top of the TCP/IP. Each message consists of a 2 byte code field and 2 byte length field followed by one or more submessages. The length specifies the total length of all of the submessages including the 4 bytes for code and length that make up this message.

19.3.5 Data Format

The submessages each have a 2 byte submessage code and a 2 byte length followed by data specific to the submessage. The submessage length does include the length of the code and length fields thus no submessage can be less than 4 bytes long and likewise no message can be less than 4 bytes long.

Submessages from AGW to Surface Movement Advisory PC

Submessage	Code
SMA Active Track Maintenance Msg	0x1370
SMA Delete Flight Data Msg	0x1371
SMA Delete Track Msg	0x1372
SMA Flight Plan Maintenance Msg	0x1373
SMA Heartbeat Msg	0x1374
SMA Adaptation Msg	0x1376

Submessages from PC to AGW

Submessage	Code
SMA PC Heartbeat Msg	0x1375

The detail structure of the submessages are described in the following sections. Typically, these structures are defined as C data structures that are included with the application program that processes the messages.

19.3.5.1 SMA Active Track Maintenance Msg (m_sma_atm)

External form of Active Track Maintenance Msg (1700). The Active Track Maintenance (ATM) message is sent from various CSCIs to indicate to the receiving CSCIs that track data has been updated. It contains the updated track position, speed, altitude, etc. The ATM message is most commonly sent by TPS and received by CPS (for linking and FP association), DPS (for display), and SMON (for recording). It is sent once per track per scan via the Track Sensor Multiqueue.

ATMs come in two categories: "principal" and "subordinate". Principal ATMs are sent in the normal case (as described above) for all tracks in all sensors, including ARSRs. Subordinate ATM messages are used in the special case when a Display Sensor Switch command is entered and an ARSR is selected to backup a given ASR. When this condition is present, TPS adds data to the message to provide transformed XY coordinates (relative to the specific ASR) and sends the ATM again via another multiqueue. This additional multiqueue is named appropriately to define the specific ARSR-ASR combination. The sub_sensor field distinguishes Principal ATMs from Subordinate ATMs: IF sub_sensor == NULL_SENSOR, THEN this is a Principal ATM. The fields sub_rept_pos_x, sub_rept_pos_y, and sub_rep_range only have meaning in Subordinate ATMs.

Table 19.3.5.1.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUMMSGL	1	Y
3	Predicted Altitude - Uncorrected	pre_alt	Scaled	Feet	-1000..99900	1/8	N
4	Reported Altitude - Corrected	rep_alt	Scaled	Feet	-1000..99900	1/8	N
5	Smoothed Altitude - Uncorrected	smooth_alt	Scaled	Feet	-1000..99900	1/8	N
6	Time of Last Correlation (zulu msecs)	last_coorel	Int	msec	0..86399999	1	N
7	Altitude Correction Factor	alt_correction	Int	Feet	-1900..2900	1/8	N
8	Altitude Velocity	alt_veloc	Int	Feet/Sec	-1000..1000	1/8	N
9	Track Reported X Coord	rept_pos_x	Scaled	NM	-256..256	1/128	N
10	Track Reported Y Coord	rept_pos_y	Scaled	NM	-256..256	1/128	N
11	Subordinate Track Reported X Coord	sub_rept_pos_x	Scaled	NM	-256..256	1/128	N
12	Subordinate Track Reported Y Coord	sub_rept_pos_y	Scaled	NM	-256..256	1/128	N
13	X Velocity	xdot	Scaled	NM/Sec	-0.25..0.25	1/65536	N
14	Y Velocity	ydot	Scaled	NM/Sec	-0.25..0.25	1/65536	N
15	Altitude Acceleration	alt_accel	Scaled	Ft/Sec/Sec	-160..160	1/8	N
16	Track Predicted Azimuth	azimuth	Scaled	ACP	0..4096	1/16	N
17	Track Predicted Range	range	Scaled	NM	0..256	1/256	N
18	Reported Beacon Code	rbc	Int	N/A	0..07777	1	N
19	Last Valid Reported Azimuth	rep_azimuth	Scaled	ACP	0..4096	1/16	N
20	Last Valid Reported Range	rep_range	Scaled	NM	0..256	1/256	N
21	Subordinate Reported Range	sub_rep_range	Scaled	NM	0..256	1/256	N
22	Track Reported System X Coord	rept_sys_x	Scaled	NM	0..1024	1/64	N
23	Track Reported System Y Coord	rept_sys_y	Scaled	NM	0..1024	1/64	N

24	Track Speed	speed	Scaled	NM/sec	0..0.25	1/65536	N
25	Track Number	trk_num	Int	N/A	1..TQi	1	Y
26	Pseudo Track	pseudo_trk	Boolean	N/A	0..1	N/A	N
27	Altitude Firmness	alt_firm	Int	N/A	0..17	N/A	N
28	Altitude History	alt_sld_window	Encoded	N/A	0..0377	N/A	N
29	Track Firmness Value	firmness	Int	N/A	0..39	N/A	N
30	Principal Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
31	Track Usage Status	status_ut	Enum	N/A	N/A	N/A	N
32	Subordinate Sensor Number	sub_sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
33	Track Class	tr_class	Enum	N/A	N/A	N/A	N
34	Mode 3A (RBC) Validity	va	Enum	N/A	0..3	N/A	N
35	Mode C (altitude) Validity	vc	Enum	N/A	0..3	N/A	N
36	Beacon Correlation	bcn_corl	Boolean	N/A	0..1	N/A	N
37	Deviation Trial Track	deviat	Boolean	N/A	0..1	N/A	N
38	Drop BCID Request	drop_bcid	Boolean	N/A	0..1	N/A	N
39	Emergency Indicator	em	Boolean	N/A	0..1	N/A	N
40	Initial Track Indicator	initial	Boolean	N/A	0..1	N/A	N
41	No Altitude	no_alt	Boolean	N/A	0..1	N/A	N
42	No RBC	no_rbc	Boolean	N/A	0..1	N/A	N
43	Parrot Track Indicator	parrot_trk	Boolean	N/A	0..1	N/A	N
44	Radar Correlation	rdr_corl	Boolean	N/A	0..1	N/A	N
45	Radar Only Track	rdr_only_trk	Boolean	N/A	0..1	N/A	N
46	Special Position Ident	spi	Boolean	N/A	0..1	N/A	N
47	Terminate Requested	term_req	Boolean	N/A	0..1	N/A	N
48	Training Status	tng	Boolean	N/A	0..1	N/A	N
49	Unreasonable Mode C	un_modec	Boolean	N/A	0..1	N/A	N
50	Valid Altitude	valid_alt	Boolean	N/A	0..1	N/A	N

Table 19.3.5.1.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1370	uns16	1	31-16
2	Submessage Length	Message Length = 84 bytes	uns16	1	15-0
3	Predicted Altitude - Uncorrected		int32	2	31-0
4	Reported Altitude - Corrected		int32	3	31-0
5	Smoothed Altitude - Uncorrected		int32	4	31-0
6	Time of Last Correlation (zulu msecs)		uns32	5	31-0
7	Altitude Correction Factor		int16	6	31-16
8	Altitude Velocity		int16	6	15-0
9	Track Reported X Coord		int16	7	31-16
10	Track Reported Y Coord		int16	7	15-0
11	Subordinate Track Reported X Coord		int16	8	31-16
12	Subordinate Track Reported Y Coord		int16	8	15-0
13	X Velocity		int16	9	31-16
14	Y Velocity		int16	9	15-0
15	Altitude Acceleration		int16	10	31-16
16	Track Predicted Azimuth		uns16	10	15-0
17	Track Predicted Range	DPS Checks 0..90.5	uns16	11	31-16
18	Reported Beacon Code		uns16	11	15-0

19	Last Valid Reported Azimuth		uns16	12	31-16
20	Last Valid Reported Range		uns16	12	15-0
21	Subordinate Reported Range		uns16	13	31-16
22	Track Reported System X Coord		uns16	13	15-0
23	Track Reported System Y Coord		uns16	14	31-16
24	Track Speed		uns16	14	15-0
25	Track Number		uns16	15	31-16
26	Pseudo Track		uns16	15	15-0
27	Altitude Firmness		uns8	16	31-24
28	Altitude History		uns8	16	23-16
29	Track Firmness Value		uns8	16	15-8
30	Principal Sensor Number		uns8	16	7-0
31	Track Usage Status	ASSOCIATED(1)=associated UNASSOCIATED(3)=unassociated	uns8	17	31-24
32	Subordinate Sensor Number		uns8	17	23-16
33	Track Class	NORMAL_TRACK(0)=Normal PARENT_TRACK(1)=Parent TRIAL_TRACK(2)=Parent Trial TENTATIVE_TRACK(3)=Tentative	uns8	17	15-8
34	Mode 3A (RBC) Validity	NOTVALID(0)=Invalid GARBLED(1)=Garbled VALID_MODE3A(2)=Report Mode 3A Check VALID(3)=Valid	uns8	17	7-0
35	Mode C (altitude) Validity	NOTVALID(0)=Invalid GARBLED(1)=Garbled VALID_MODEC(2)=Reported Mode C Check VALID(3)=Valid	uns8	18	31-24
36	Beacon Correlation		boolean	18	23-16
37	Deviation Trial Track		boolean	18	15-8
38	Drop BCID Request		boolean	18	7-0
39	Emergency Indicator		boolean	19	31-24
40	Initial Track Indicator		boolean	19	23-16
41	No Altitude		boolean	19	15-8
42	No RBC		boolean	19	7-0
43	Parrot Track Indicator		boolean	20	31-24
44	Radar Correlation		boolean	20	23-16
45	Radar Only Track		boolean	20	15-8
46	Special Position Ident		boolean	20	7-0
47	Terminate Requested		boolean	21	31-24
48	Training Status		boolean	21	23-16
49	Unreasonable Mode C		boolean	21	15-8
50	Valid Altitude		boolean	21	7-0

19.3.5.2 SMA Heartbeat Msg (m_sma_fast_hbeat)

External form of the AGW Heartbeat Msg (1301). This submessage is sent by the SMA CSCI once per second. It contains the SMA process state and the current system time. The SMA State contains one of the following values:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

Table 19.3.5.2.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	Current System Time within day	system_time	Int	msec	0..86399999	1	Y
4	Day of Year	day_of_year	Int	N/A	1..366	N/A	Y
5	Four digits - year	year	Int	N/A	1970..2037	N/A	Y
6	FAST State (see text)	fast_state	Enum	N/A	0..3	N/A	N
7	Pad msg to multiple of 32 bits	pad[3]	char	N/A	N/A	N/A	N

Table 19.3.5.2.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1374	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	Current System Time within day		uns32	2	31-0
4	Day of Year		uns16	3	31-16
5	Four digits - year		uns16	3	15-0
6	CTIS State (see text)		uns8	4	31-24
7	Pad msg to multiple of 32 bits		uns8	4	23-0

19.3.5.3 SMA Delete Track Msg (m_sma_dtm)

External form of the Delete Track Msg (1704). This message is sent whenever the TPS sets a track slot to unused. The Delete Track Msg is used to inform the DP and CP to set the corresponding track slot to unused status. This submessage is recorded by CDR when either the TA or TU extraction class is enabled.

Table 19.3.5.3.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUBMSGL	1	Y
3	Track Number	trk_num	Int	N/A	1..TQi	1	Y
4	Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
5	Subordinate Sensor Number	sub_sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y

Table 19.3.5.3.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1372	uns16	1	31-16
2	Submessage Length	Message Length = 8 bytes	uns16	1	15-0
3	Track Number		uns16	2	31-16
4	Sensor Number		uns8	2	15-8
5	Subordinate Sensor Number		uns8	2	7-0

19.3.5.4 SMA Flight Plan Maintenance Msg (m_sma_afpm)

External Form of the Flight Plan Maintenance Msg (1800). This submessage is sent for each active associated track. It contains the current flight plan information. This submessage is transmitted each scan to permit initialization of any display within one scan. This submessage is recorded by CDR when the TA extraction class is enabled.

The Interfacility Message Types for a flight plan are as follows:

CF_NOSTATUS	0	No Interfacility Status
CF_DA	1	DA
CF_DX	2	DX
CF_DR	3	DR
CF_DT	4	DT
CF_TR	5	TR
CF_TB	6	TB
CF_DM	7	DM
CF_TU	8	TU
CF_TI	9	TI
CF_TA	10	TA
CF_FP	11	FP
CF_AM	12	AM
CF_CX	13	CX
CF_TL	14	TL
CF_TM	15	TM
CF_TN	16	TN
CF_RF	17	RF
CF_TS	18	TS
CF_TP	19	TP
CF_TZ	20	TZ
CF_VFRFP	21	VFR FP
CF_ARSAFP	22	ARSA FP
CF_MIDTU	23	Middle TU
CF_ENDTU	24	End TU
CF_EXPFP	25	Expect FP
CF_EXPTU	26	Expect TU

Table 19.3.5.4.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Flight Plan Maintenance Msg code	code	Int	code	0..xFFFF	N/A	Y
2	Flight Plan Maintenance Msg length	lgth	Int	bytes	MAFPML	1	Y
3	Assigned beacon code	abc	Int	N/A	0..07777	N/A	N
4	Active controller	act_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y

5	Auto-handoff altitude	aho_alt	Int	feet	0..995	100 ft.	N
6	Track requested altitude	alt_req	Int	feet	-99..999	100 ft.	N
7	Flight Plan assigned altitude	asg_alt	Int	feet	0..999	100 ft.	N
8	ETA/PTD in minutes since midnight	eta_ptd	Int	minutes	0..60*24-1	1	N
9	FDF Number	fdf_num	Int	N/A	1..MAX_FDFQ	N/A	N
10	Directed Handoff controller	ho_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
11	IF message number	if_msgno	Int	N/A	1..999	N/A	N
12	IF message time delta	if_msgtime_delt a	Int	seconds	0..65535	1	N
13	IF TU time delta	if_tutime_delta	Int	seconds	0..65535	1	N
14	Old Primary Controller	old_pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
15	Primary controller	pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y
16	Run Down List	rund	Int	N/A	0..MAX_NUMKQ	N/A	N
17	Satellite List Azimuth	sat_list_azimuth	Int	degrees	0..359	1	N
18	Satellite List Range	sat_list_range	Int	NM	0..64	1	N
19	TCID	tcid	Int	N/A	1..999	N/A	N
20	TI/TA beacon code	tita_bcn	Int	N/A	0..07777	N/A	N
21	Track number (per sensor)	track_nbr[[MAX _SENSQ]=1]	Int	N/A	0..TQi	N/A	N
22	Track number (per sensor)	track_nbr[[MAX _SENSQ]= 15]	Int	N/A	0..TQi	N/A	N
23	Sensor link/no link indicator	link	Boolean	N/A	0..1	N/A	N
24	Sensor real/pseudo link indicator	pseudo	Boolean	N/A	0..1	N/A	N
25	Sensor link/no link indicator	link	Boolean	N/A	0..1	N/A	N
26	Sensor real/pseudo link indicator	pseudo	Boolean	N/A	0..1	N/A	N
27	Assigned beacon code status	abc_stat	Enum	N/A	0..2	N/A	N
28	ACID number of non-space chars	acid_non_space	Int	N/A	2..7	N/A	N
29	Aircraft category	ac_cat	ASCII	N/A	H/T/B/F/L	N/A	N
30	Original Aircraft category	orig_ac_cat	ASCII	N/A	H/T/B/F/L/V/U/W	N/A	N
31	Arrival/Departure/Enroute status	ade_stat	Enum	N/A	0..255	N/A	Y
32	Auto-handoff index	aho_ind	Int	N/A	-1..127	N/A	N
33	Adjacent ARTS ID	arts_id	Int	N/A	0..MAX_NO_FACIL	N/A	N
34	Aircraft type disp counter	atcc	Int	scans	0..7	1	N
35	BRITE List Nr by Geo Area	brite_list_nbr[[MAX_GEO_BR ITE]=1]	Int	N/A	0..MAX_BRT_LIST	1	N
36	BRITE List Nr by Geo Area	brite_list_nbr[[MAX_GEO_BR ITE]= 8]	Int	N/A	0..MAX_BRT_LIST	1	N
37	Flight plan adaptor number	fpa	Int	N/A	0..3	1	N
38	FP status controlled VFR flight	fpstatus	Enum	N/A	0..2	N/A	Y
39	Handoff Countdown	ho_cntdn	Int	N/A	0..63	N/A	N
40	Handoff status	ho_stat	Enum	N/A	0..IF_HO_2_ARTCC	N/A	Y
41	Count of DX messages received	if_dx	Int	N/A	0..IF_ITRQ	N/A	N
42	Count of attempts to send a msg	if_msgcount	Int	N/A	0..IF_MAX_RETRY	N/A	N
43	ARTCC sector handing off to	if_sector	INt	N/A	0..31	N/A	N
44	ARTCC site messages are	if_site	Int	N/A	0..3	N/A	N

	sent to						
45	IF message status	if_stat	Enum	N/A	0..24	N/A	N
46	Keyboard subset	kbd_subset	Int	N/A	1..7	N/A	N
47	Leader direction from change req	ldr_dir	Enum	N/A	0..7	N/A	N
48	Active radar subsystem	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	N/A	N
49	Track type	status_tp	Enum	N/A	0..3	N/A	N
50	Track usage status	status_ut	Enum	N/A	1..3	N/A	N
51	Tab coast out-of-range tracks	tab_or	Enum	N/A	0.2.3	N/A	N
52	Display number for VFR list	vfr_dsp_nbr	Int	N/A	1..MAX_NUMDQ	N/A	N
53	VFR fp stat	vfr_fp_stat	Enum	N/A	0..3	N/A	N
54	4 Aircraft type characters	ac_type[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
55	4 Aircraft type characters	ac_type[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
56	Track assigned altitude	alt_asg[[4]=1]	ASCII	ft	NULL 001..999	100 ft	N
57	Track assigned altitude	alt_asg[[4]= 4]	ASCII	ft	NULL 001..999	100 ft	N
58	Symbol and Subset of ART-ART UHO	art2art_uho[[2]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
59	Symbol and Subset of ART-ART UHO	art2art_uho[[2]=2]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
60	ARTS to ARTS symbol	atoa_sym	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
61	Airport and SS entry fixes	entry_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
62	Airport and SS entry fixes	entry_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
63	Airport and SS exit fixes	exit_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
64	Airport and SS exit fixes	exit_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
65	Exit Fix characters	exitfix_char[[MAX_AREA_LEVELS]=1]	ASCII	N/A	'A'-'Z'	N/A	N
66	Exit Fix characters	exitfix_char[[MAX_AREA_LEVELS]= 10]	ASCII	N/A	'A'-'Z'	N/A	N
67	8 Aircraft ID characters	fid[[8]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
68	8 Aircraft ID characters	fid[[8]= 8]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
69	Fix Pair Scratch Pad	fixpair_scratpad[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
70	Fix Pair Scratch Pad	fixpair_scratpad[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
71	ECID (ddA)	if_ecid[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
72	ECID (ddA)	if_ecid[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
73	TCID of other ARTS site	if_tcid[[3]=1]	ASCII	N/A	'0'-'9'	N/A	N
74	TCID of other ARTS site	if_tcid[[3]= 3]	ASCII	N/A	'0'-'9'	N/A	N
75	Keyboard symbol	kybdsymb	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
76	Satellite airport symbol	sat_apt	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
77	Scratch Pad 1 Characters	scratch_pad[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
78	Scratch Pad 1 Characters	scratch_pad[[3]=3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
79	Scratch Pad 2 Characters	scratch_pad2[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
80	Scratch Pad 2 Characters	scratch_pad2[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
81	Site adapted alpha character	sitechar	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
82	Tabular line identifier	tablinid	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	Y
83	VFR FP Tab Line Identifier	vfrfp_linid	ASCII	N/A	'0'-'9' space	N/A	N
84	Auto-acquire flag	aa	Boolean	N/A	0..1	N/A	N
85	Assigned Altitude flag	asng_alt	Boolean	N/A	0..1	N/A	N

86	BRITE eligibility indicator	brite_eligib	Boolean	N/A	0..1	N/A	N
87	Inhibit CA single trk ind	cai_inh_proc	Boolean	N/A	0..1	N/A	N
88	Inhibt CA ind for trk pair	cai_pair	Boolean	N/A	0..1	N/A	N
89	VFR beacon code inhib indicator	cai_vfr_rbc	Boolean	N/A	0..1	N/A	N
90	CA inhibit zone suppress	cai_zone_sup	Boolean	N/A	0..1	N/A	N
91	Scratchpad change for CTAS	chg_scratpad	Boolean	N/A	0..1	N/A	N
92	CA alert display indicator	disp_ca	Boolean	N/A	0..1	N/A	N
93	MSAW Climb indicator	disp_climb	Boolean	N/A	0..1	N/A	N
94	Display DB indicator	disp_db	Boolean	N/A	0..1	N/A	N
95	Display DM indicator	disp_dm	Boolean	N/A	0..1	N/A	N
96	Display/retain FDB indicator	disp_fdb	Boolean	N/A	0..1	N/A	N
97	Display blinking FP indicator	disp_fp	Boolean	N/A	0..1	N/A	N
98	Display blinking IF indicator	disp_if	Boolean	N/A	0..1	N/A	N
99	MSAW warning indictor	disp_la	Boolean	N/A	0..1	N/A	N
100	Display interfacility NAT ind	disp_nat	Boolean	N/A	0..1	N/A	N
101	Display OLD indicator	disp_old	Boolean	N/A	0..1	N/A	N
102	Display Pointout indicator	disp_po	Boolean	N/A	0..1	N/A	N
103	Emer/radio fail/hijack indicator	em	Boolean	N/A	0..1	N/A	N
104	Exit Fix is Primary Airport ind	exitfix_is_pri_ap t	Boolean	N/A	0..1	N/A	N
105	Flashing ABC indicator	flash_abc	Boolean	N/A	0..1	N/A	N
106	Forced control change	force_ctl_chg	Boolean	N/A	0..1	N/A	N
107	Freeze full data block indicator	frz_fdb	Boolean	N/A	0..1	N/A	N
108	Global leader dir ind F7 L dd	global_ldr	Boolean	N/A	0..1	N/A	N
109	Heavy aircraft indicator	heavy	Boolean	N/A	0..1	N/A	N
110	Interfacility handoff complete	ho_comp	Boolean	N/A	0..1	N/A	N
111	Inhibit auto acquisition	iaa	Boolean	N/A	0..1	N/A	N
112	Interfacility late hand-off ind	iaf_lho	Boolean	N/A	0..1	N/A	N
113	IF ARSA Indicator	if_arsa	Boolean	N/A	0..1	N/A	N
114	IF AHO inhibited (delta) flag	if_delta	Boolean	N/A	0..1	N/A	N
115	IF late handoff indicator	if_lho	Boolean	N/A	0..1	N/A	N
116	Inhibit a/c type indicatr	inhactyp	Boolean	N/A	0..1	N/A	N
117	Inhibit Mode C altitude	inhmodec	Boolean	N/A	0..1	N/A	N
118	Inhibit AMB indicator	inh_amb	Boolean	N/A	0..1	N/A	N
119	Inhibit blinking HO	inh_bho	Boolean	N/A	0..1	N/A	N
120	Inhibit auto-handoff	inh_ifaho	Boolean	N/A	0..1	N/A	N
121	Display intrafacility NAT ind	intra_nat	Boolean	N/A	0..1	N/A	N
122	MSAW alert display indicator	lai_inh_disp	Boolean	N/A	0..1	N/A	N
123	Inhibit MSAW processing ind	lai_inh_proc	Boolean	N/A	0..1	N/A	N
124	Leader Direction Change Request	ldr_dir_chg	Boolean	N/A	0..1	N/A	N

125	Out of range indicator	outofrng	Boolean	N/A	0..1	N/A	N
126	Radar only flight plan indicator	rdr_only	Boolean	N/A	0..1	N/A	N
127	Ring remote MSAW alarm	remote_alarm	Boolean	N/A	0..1	N/A	N
128	MSAW alarm indicator	ring_msaw	Boolean	N/A	0..1	N/A	N
129	Satellite List Entry	sat_list_entry	Boolean	N/A	0..1	N/A	N
130	Suspend out-of-range indicator	sdor	Boolean	N/A	0..1	N/A	N
131	Special Offset	sp_off	Boolean	N/A	0..1	N/A	N
132	Track active status	status_a	Boolean	N/A	0..1	N/A	N
133	Suspend trk trk/not trk	susp_trk_not_trk	Boolean	N/A	0..1	N/A	N
134	Suspend track special symbol	sus_trk_sym	Boolean	N/A	0..1	N/A	N
135	TA beacon code received	taval	Boolean	N/A	0..1	N/A	N
136	TI beacon code received	tival	Boolean	N/A	0..1	N/A	N
137	Live/training track indicator	tng	Boolean	N/A	0..1	N/A	N
138	VFR Fix intermediate flag	vfrfp_fixint	Boolean	N/A	0..1	N/A	N
139	VFR fp originated at ARTS	vfr_arts	Boolean	N/A	0..1	N/A	N
140	VFR flight plan	vfr_fp	Boolean	N/A	0..1	N/A	N
141	Zone/floor suppress indicator	zone_sup	Boolean	N/A	0..1	N/A	N

Table 19.3.5.4.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Flight Plan Maintenance Msg code	Message Code = 1373	uns16	1	31-16
2	Flight Plan Maintenance Msg length	Message Length = 248 bytes	uns16	1	15-0
3	Assigned beacon code		uns16	2	31-16
4	Active controller		uns16	2	15-0
5	Auto-handoff altitude		uns16	3	31-16
6	Track requested altitude		int16	3	15-0
7	Flight Plan assigned altitude		int16	4	31-16
8	ETA/PTD in minutes since midnight		uns16	4	15-0
9	FDF Number		uns16	5	31-16
10	Directed Handoff controller		uns16	5	15-0
11	IF message number		uns16	6	31-16
12	IF message time delta	(seconds)	uns16	6	15-0
13	IF TU time delta	(seconds)	uns16	7	31-16
14	Old Primary Controller		uns16	7	15-0
15	Primary controller		uns16	8	31-16
16	Run Down List		uns16	8	15-0
17	Satellite List Azimuth	from airport	uns16	9	31-16
18	Satellite List Range	from airport	uns16	9	15-0
19	TCID		uns16	10	31-16
20	TI/TA beacon code		uns16	10	15-0
21	Track number (per sensor)		uns16	11	31-16
22	Track number (per sensor)		uns16	18	31-16
23	Sensor link/no link indicator	These [Fields = 2] are repeated [[MAX_SENSQ] =1] times	boolean	18	15-8
24	Sensor real/pseudo link indicator		boolean	18	7-0
25	Sensor link/no link indicator	These [Fields = 2] are repeated [[MAX_SENSQ] = 15] times	boolean	25	15-8
26	Sensor real/pseudo link indicator		boolean	25	7-0
27	Assigned beacon code status	ABC_EXISTS(0)=assigned TENT_ABC(1)=tentative assigned NO_ABC(2)=no assigned	uns8	26	31-24
28	ACID number of non-space chars		uns8	26	23-16
29	Aircraft category		uns8	26	15-8
30	Original Aircraft category		uns8	26	7-0
31	Arrival/Departure/Enroute status	Must be ADE_OVERFLIGHT or ADE_ARR_UNKNOWN..ADE_ARRU or ADE_DEP_UNKNOWN..ADEPU	uns8	27	31-24
32	Auto-handoff index		int8	27	23-16
33	Adjacent ARTS ID		uns8	27	15-8
34	Aircraft type disp counter		uns8	27	7-0
35	BRITE List Nr by Geo Area		uns8	28	31-24
36	BRITE List Nr by Geo Area		uns8	29	7-0

37	Flight plan adaptor number		uns8	30	31-24
38	FP status controlled VFR flight	0 = IFR1 = VFR2 = VFR_ON_TOP	uns8	30	23-16
39	Handoff Countdown		uns8	30	15-8
40	Handoff status	0=not in handoff 1=intrafacility countdown 2=interfacility countdown 3=intrafacility 4=to ARTCC 5=from ARTCC	uns8	30	7-0
41	Count of DX messages received		uns8	31	31-24
42	Count of attempts to send a msg		uns8	31	23-16
43	ARTCC sector handing off to		uns8	31	15-8
44	ARTCC site messages are sent to		uns8	31	7-0
45	IF message status	See text	uns8	32	31-24
46	Keyboard subset		uns8	32	23-16
47	Leader direction from change req	LDR_N(0)=North LDR_NE(1)=Northeast LDR_E(2)=EastLDR_SE(3)=Southeast LDR_S(4)=South LDR_SW(5)=Southwest LDR_W(6)=WestLDR_NW(7)=Northwest	uns8	32	15-8
48	Active radar subsystem		uns8	32	7-0
49	Track type	0=store 1=tab coast 2=suspend not tracking 3=suspend	uns8	33	31-24
50	Track usage status	ASSOCIATED(1)=associated UNASSOCIATED(3)=unassociated	uns8	33	23-16
51	Tab coast out-of-range tracks	0=not OR 2=OR 3=blinking OR	uns8	33	15-8
52	Display number for VFR list		uns8	33	7-0
53	VFR fp stat	0=VFR 1=FIX 2=IFP	uns8	34	31-24
54	4 Aircraft type characters		char	34	23-16
55	4 Aircraft type characters		char	35	31-24
56	Track assigned altitude		char	35	23-16
57	Track assigned altitude		char	36	31-24
58	Symbol and Subset of ART-ART UHO		char	36	23-16
59	Symbol and Subset of ART-ART UHO		char	36	15-8
60	ARTS to ARTS symbol		char	36	7-0
61	Airport and SS entry fixes		char	37	31-24
62	Airport and SS entry fixes		char	37	7-0
63	Airport and SS exit fixes		char	38	31-24
64	Airport and SS exit fixes		char	38	7-0
65	Exit Fix characters		char	39	31-24
66	Exit Fix characters		char	41	23-16
67	8 Aircraft ID characters		char	41	15-8
68	8 Aircraft ID characters		char	43	23-16
69	Fix Pair Scratch Pad		char	43	15-8
70	Fix Pair Scratch Pad		char	44	31-24
71	ECID (ddA)		char	44	23-16

72	ECID (ddA)		char	44	7-0
73	TCID of other ARTS site		char	45	31-24
74	TCID of other ARTS site		char	45	15-8
75	Keyboard symbol		char	45	7-0
76	Satellite airport symbol		char	46	31-24
77	Scratch Pad 1 Characters		char	46	23-16
78	Scratch Pad 1 Characters		char	46	7-0
79	Scratch Pad 2 Characters		char	47	31-24
80	Scratch Pad 2 Characters		char	47	15-8
81	Site adapted alpha character		char	47	7-0
82	Tabular line identifier		char	48	31-24
83	VFR FP Tab Line Identifier		char	48	23-16
84	Auto-acquire flag		boolean	48	15-8
85	Assigned Altitude flag		boolean	48	7-0
86	BRITE eligibility indicator		boolean	49	31-24
87	Inhibit CA single trk ind		boolean	49	23-16
88	Inhibt CA ind for trk pair		boolean	49	15-8
89	VFR beacon code inhib indicator		boolean	49	7-0
90	CA inhibit zone suppress		boolean	50	31-24
91	Scratchpad change for CTAS		boolean	50	23-16
92	CA alert display indicator		boolean	50	15-8
93	MSAW Climb indicator		boolean	50	7-0
94	Display DB indicator		boolean	51	31-24
95	Display DM indicator		boolean	51	23-16
96	Display/retain FDB indicator		boolean	51	15-8
97	Display blinking FP indicator		boolean	51	7-0
98	Display blinking IF indicator		boolean	52	31-24
99	MSAW warning indictor		boolean	52	23-16
100	Display interfacility NAT ind		boolean	52	15-8
101	Display OLD indicator		boolean	52	7-0
102	Display Pointout indicator		boolean	53	31-24
103	Emer/radio fail/hijack indicator		boolean	53	23-16
104	Exit Fix is Primary Airport ind		boolean	53	15-8
105	Flashing ABC indicator		boolean	53	7-0
106	Forced control change		boolean	54	31-24
106	Freeze full data block indicator		boolean	54	23-16
108	Global leader dir ind F7 L dd		boolean	54	15-8
109	Heavy aircraft indicator		boolean	54	7-0
110	Interfacility handoff complete		boolean	55	31-24
111	Inhibit auto acquisition		boolean	55	23-16
112	Interfacility late hand-off ind		boolean	55	15-8

113	IF ARSA Indicator		boolean	55	7-0
114	IF AHO inhibited (delta) flag		boolean	56	31-24
115	IF late handoff indicator		boolean	56	23-16
116	Inhibit a/c type indicatr		boolean	56	15-8
117	Inhibit Mode C altitude		boolean	56	7-0
118	Inhibit AMB indicator		boolean	57	31-24
119	Inhibit blinking HO		boolean	57	23-16
120	Inhibit auto-handoff		boolean	57	15-8
121	Display intrafacility NAT ind		boolean	57	7-0
122	MSAW alert display indicator		boolean	58	31-24
123	Inhibit MSAW processing ind		boolean	58	23-16
124	Leader Direction Change Request		boolean	58	15-8
125	Out of range indicator		boolean	58	7-0
126	Radar only flight plan indicator		boolean	59	31-24
127	Ring remote MSAW alarm		boolean	59	23-16
128	MSAW alarm indicator		boolean	59	15-8
129	Satellite List Entry		boolean	59	7-0
130	Suspend out-of-range indicator		boolean	60	31-24
131	Special Offset		boolean	60	23-16
132	Track active status		boolean	60	15-8
133	Suspend trk trk/not trk		boolean	60	7-0
134	Suspend track special symbol		boolean	61	31-24
135	TA beacon code received		boolean	61	23-16
136	TI beacon code received		boolean	61	15-8
137	Live/training track indicator		boolean	61	7-0
138	VFR Fix intermediate flag		boolean	62	31-24
139	VFR fp originated at ARTS		boolean	62	23-16
140	VFR flight plan		boolean	62	15-8
141	Zone/floor suppress indicator		boolean	62	7-0

19.3.5.5 SMA PC Heartbeat Msg (m_sma_hbeat)

This submessage is sent to the AGW once per second by the SMA PC. The CTIS CSCI will process this message to determine the presence of the Noise Monitor PC and the condition of the interconnecting network link.

The SMA State field contains one of the following values representing the state of the SMA PC:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

Table 19.3.5.5.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	SMA State (see text)	sma_state	Enum	N/A	0..3	N/A	N
4	Pad msg to multiple of 32 bits	pad[3]	char	N/A	N/A	N/A	N

Table 19.3.5.5.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1375	uns16	1	31-16
2	Submessage length	Message Length = 18 bytes	uns16	1	15-0
3	SMA State (see text)		uns8	2	31-24
4	Pad msg to multiple of 32 bits		uns8	2	23-0

19.3.5.6 SMA Delete Flight Data Msg (m_sma_d_fp)

External form of the Delete Flight Data Msg (1809). This submessage is sent whenever the CP sets an FDF record to unused. It is used to inform the DP to set the corresponding FDF record to unused status.

Table 19.3.5.6.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
3	Record number in CP FDF	fp_nbr	Int	N/A	1..MAX_FDFQ	1	Y
4	Sensor number	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	1	N
5	Live/training track indicator	training	Boolean	N/A	0..1	N/A	N

Table 19.3.5.6.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1371	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	Record number in CP FDF		uns16	2	31-16
4	Sensor number		uns8	2	15-8
5	Live/training track indicator		boolean	2	7-0

19.3.5.7 SMA Adaptation Msg for SMA (m_sma_adapt)

This submessage is sent to the SMA PC only on SMA transition to Active state. The message transfers Lat/Long System Plane coordinates.

Table 19.3.5.7.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
3	Sensor Range	sensor_range[MAX_SENSQ]	Float	NM	30..256	.01	N
4	Scan Time for Each Sensor	scanq[MAX_SENSQ]	Float	seconds	2..14	.01	N
5	RTQC Station Altitude	sensor_alt[MAX_SENSQ]	Float	feet	-1000..10000	1	N
6	Radius of the conformal sphere in NM	sc_conf_radius	Float	NM	3300..3600	.01	N
7	Conformal Latitude of Tangency Point	sc_tan_co_lat	Float				N
8	Longitude of Tangency Point	sc_tan_lon	Float	radians	0..PI	.01	N
9	Stereographic Origin X-Offset	sc_xt	Float	NM	0..500	.01	N
10	Stereographic Origin Y-	sc_yt	Float	NM	0..500	.01	N

	Offset						
11	Maximum System X Coordinate	sc_max_sys_x	Float	NM	0..1100	.01	N
12	Maximum System Y Coordinate	sc_max_sys_y	Float	NM	0..1100	.01	N
13	Minimum System X Coordinate	sc_min_sys_x	Float	NM	0..0	.01	N
14	Minimum System Y Coordinate	sc_min_sys_y	Float	NM	0..0	.01	N
15	Sensor System X Coordinate	sc_sensor_sys_x[MAX_SENSQ]	Float	NM	0..1100	.01	N
16	Sensor System Y Coordinate	sc_sensor_sys_y[MAX_SENSQ]	Float	NM	0..1100	.01	N
17	Sine of Physical to True North Rotation Angle	sine_phys_to_true [MAX_SENSQ]	Float	radians	-1..1	.00001	N
18	Sine of Rotation Angle from True to Magnetic North	sine_true_to_mag [MAX_SENSQ]	Float	radians	-1..1	.00001	N
19	Number of Sensors	nsensq	Int	sensors	1..MAX_SENSQ	1	N
20	16 bit pad - 32 bit word boundary	pad1	Int	N/A	N/A	N/A	N
21	Type of Sensor (ASR/ARSR)	sensor_type[MA X_SENSQ]	Int	N/A		N/A	N
22	32-bit pad	pad2	Int	N/A	N/A	N/A	N
23	Site ID Characters	site_id[4]	ASCII	N/A	3..3	N/A	N
24	Long Name for each Sensor	sensor_lname[M AX_SENSQ][40]	ASCII	N/A	1..39	N/A	N
25	Short 3 Character Sensor Names	sensor_abbr[MA X_SENSQ][4]	ASCII	N/A	3..3	N/A	N
26	Single Character Sensor ID	sensor_char[MA X_SENSQ][2]	ASCII	N/A	1..1	N/A	N
27	32-bit pad	pad3[2]	char	N/A	N/A	N/A	N

Table 19.3.5.7.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1376	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	Sensor Range		realf	2	31-0
4	Scan Time for Each Sensor		realf	17	31-0
5	RTQC Station Altitude		realf	32	31-0
6	Radius of the conformal sphere in NM		realf	47	31-0
7	Conformal Latitude of Tangency Point		realf	48	31-0
8	Longitude of Tangency Point		realf	49	31-0
9	Stereographic Origin X-Offset		realf	50	31-0
10	Stereographic Origin Y-Offset		realf	51	31-0
11	Maximum System X Coordinate		realf	52	31-0
12	Maximum System Y Coordinate		realf	53	31-0
13	Minimum System X	This value is always set to 0 for Common ARTS A6.05/A2.09	realf	54	31-0

	Coordinate				
14	Minimum System Y Coordinate	This value is always set to 0 for Common ARTS A6.05/A2.09	realf	55	31-0
15	Sensor System X Coordinate		realf	56	31-0
16	Sensor System Y Coordinate		realf	71	31-0
17	Sine of Physical to True North Rotation Angle		realf	86	31-0
18	Sine of Rotation Angle from True to Magnetic North		realf	101	31-0
19	Number of Sensors		uns16	116	15-0
20	16 bit pad - 32 bit word boundary		uns16		15-0
21	Type of Sensor (ASR/ARSR)	ASR = 0, ARSR = 1	uns8	117	7-0
22	32-bit pad		uns8		7-0
23	Site ID Characters		char	121	7-0
24	Long Name for each Sensor		char	122	7-0
25	Short 3 Character Sensor Names		char	272	7-0
26	Single Character Sensor ID		char	287	7-0
27	32-bit pad		char		7-0

Section 20
AIRPORT MOVEMENT AND SURVEILLANCE SYSTEM INTERFACE

20.1 GENERAL DESCRIPTION

The Airport Movement and Surveillance System Interface provides tracking and flight plan information to external data collection and analysis tools. Common ARTS provides this interface through a generic firewall capability through the use of an ARTS Interface Gateway (AGW). The AGW runs various processes to interface and convert messages between Common ARTS and other equipment and acts to isolate the external equipment from the operational local area networks. An implementation of the Common Terminal Interface Software (CTIS) is used to convert the current Common ARTS messages to an external form used by the Airport Movement and Surveillance System.

20.2 REFERENCED DOCUMENTS

20.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

20.2.1.1 Applicable Government Documents

Specifications

ATC 60050	Common ARTS Interface Design Document

Standards

None.

Other Publications

None.

20.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

FIPS PUB 160	American National Standard for Information Systems - Programming Language – C
ANSI/IEEE Standard 802.3 -	Institute of Electrical and Electronic Engineers-Local Area Networks International Standards Organization (ISO) Open System Interconnect (OSI) Reference Mode and ISO Communication Protocol Standards.
IETF STD-0005	Internet Protocol, September 1981
IETF STD-0007	Transmission Control Protocol, September 1981
IETF STD-0041	Standard for the transmission of IP datagrams over Ethernet networks, April 1984

Other Publications

None.

20.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993.

FAA Computer Program Functional Specifications

ARTS NAS-MD-634, A6.05/A2.09	System Description and Specified Series, Final, Rev. A, November 1997
ARTS NAS-MD-638, A6.05/A2.09	Keyboard, Final, Rev. A, November 1997
ARTS NAS-MD-639, A6.05/A2.09	Display Output Processing and Converging Runway Display Aid (CRDA), Final, Rev. A, November 1997
ARTS NAS-MD-642, A6.05/A2.09	Error and Status Messages, Final, Rev. A, November 1997
ARTS NAS-MD-643, A6.05/A2.09	Site Adaptation, Final, Rev. A, November 1997
ARTS NAS-MD-646, A6.05/A2.09	CDR Editor, RETRACK and Disk/File Utilities, Final, Rev. A, November 1997
ARTS NAS-MD-648, A6.05/A2.09	Continuous Data Recording Processing and Performance Monitoring, Final, Rev. A, November 1997

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

20.3 AIRPORT MOVEMENT AND SURVEILLANCE SYSTEM

20.3.1 General Information

The Common ARTS Interface to the Airport Movement and Surveillance System Data Collection PC is through a 100 megabit per second ethernet running TCP/IP protocols. The ethernet interface in the AGW is used to communicate to the ethernet port on the AMASS PC. The AGW hardware in the IIIE system is made up of two VME Chassis's connected to two independent Cisco firewalls which are then connected to a hub. The AGW hardware in the IIE system is made up of a single PC connected directly to a hub.

20.3.2 Mechanical Characteristics

The ethernet connection on either the IIIE or IIE versions of the AGW are made of a RJ45 architecture. All the external systems that wish to interface to the Common ARTS system will use a RJ45 cable over a 10/100 Mbit connection to attach their computer to the same hub as that of the AGW.

20.3.3 Electrical Characteristics

The RJ45 interface that connects to the hub conforms to the industry standard layout defined for this interface. A 100 Mbit RJ45 connection is highly recommended to minimize 10Mbit bottlenecks on the network.

The PowerPC version of the AGW is a RJ45 10/100 connection into a CISCO Firewall/Router or directly into the AGW depending on site adaptation. Normal configuration is a RJ45(Cat. 5) connection into a Switch in route to a CISCO Firewall/Router(connected to the AGW), which conforms to the industry standard RJ45 10/100 Cat 5 configuration for this interface.

The Linux i86 version of the AGW is a RJ45 10/100 connection directly into the AGW or a 10/100 Switch(sites with multiple AGW clients) which conforms to the industry standard layout for this interface.

20.3.4 Network Protocol

The Airport Movement and Surveillance System interface to the Common ARTS system uses TCP/IP protocols. The Common Terminal Interface Software (CTIS) process running in the AGW acts as a TCP server listening on port **5075**. All data is passed in network byte order (big endian). The IP address for this interface is set in Common ARTS Adaptation and is physically set by CTIS when the program initializes.

Messages are passed to and from the Common ARTS AGW using a simple higher level protocol running on top of the TCP/IP. Each message consists of a 2 byte code field and 2 byte length field followed by one or more submessages. The length specifies the total length of all of the submessages including the 4 bytes for code and length that make up this message.

20.3.5 Data Format

The submessages each have a 2 byte submessage code and a 2 byte length followed by data specific to the submessage. The submessage length does include the length of the code and length fields thus no submessage can be less than 4 bytes long and likewise no message can be less than 4 bytes long.

Submessages from AGW to Airport Movement and Surveillance System PC

Submessage	Code
AMASS Active Track Maintenance Msg	0x1360
AMASS Delete Flight Data Msg	0x1361
AMASS Delete Track Msg	0x1362
AMASS Flight Plan Maintenance Msg	0x1363
AMASS Heartbeat Msg	0x1364
AMASS Altimeter and DASI Msg	0x1367

Submessages from PC to AGW

Submessage	Code
AMASS PC Heartbeat Msg	0x1365

The detail structure of the submessages are described in the following sections. Typically, these structures are defined as C data structures that are included with the application program that processes the messages.

20.3.5.1 AMASS Active Track Maintenance Msg (m_amass_atm)

External form of Active Track Maintenance Msg (1700). The Active Track Maintenance (ATM) message is sent from various CSCIs to indicate to the receiving CSCIs that track data has been updated. It contains the updated track position, speed, altitude, etc. The ATM message is most commonly sent by TPS and received by CPS (for linking and FP association), DPS (for display), and SMON (for recording). It is sent once per track per scan via the Track Sensor Multiqueue.

ATMs come in two categories: "principal" and "subordinate". Principal ATMs are sent in the normal case (as described above) for all tracks in all sensors, including ARSRs. Subordinate ATM messages are used in the special case when a Display Sensor Switch command is entered and an ARSR is selected to backup a given ASR. When this condition is present, TPS adds data to the message to provide transformed XY coordinates (relative to the specific ASR) and sends the ATM again via another multiqueue. This additional multiqueue is named appropriately to define the specific ARSR-ASR combination. The sub_sensor field distinguishes Principal ATMs from Subordinate ATMs: IF sub_sensor == NULL_SENSOR, THEN this is a Principal ATM. The fields sub_rept_pos_x, sub_rept_pos_y, and sub_rep_range only have meaning in Subordinate ATMs.

Table 20.3.5.1.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUMMSGL	1	Y
3	Predicted Altitude - Uncorrected	pre_alt	Scaled	Feet	-1000..99900	1/8	N
4	Reported Altitude - Corrected	rep_alt	Scaled	Feet	-1000..99900	1/8	N
5	Smoothed Altitude - Uncorrected	smooth_alt	Scaled	Feet	-1000..99900	1/8	N
6	Time of Last Correlation (zulu msecs)	last_coorel	Int	msec	0..86399999	1	N
7	Altitude Correction Factor	alt_correction	Int	Feet	-1900..2900	1/8	N
8	Altitude Velocity	alt_veloc	Int	Feet/Sec	-1000..1000	1/8	N
9	Track Reported X Coord	rept_pos_x	Scaled	NM	-256..256	1/128	N
10	Track Reported Y Coord	rept_pos_y	Scaled	NM	-256..256	1/128	N
11	X Velocity	xdot	Scaled	NM/Sec	-0.25..0.25	1/65536	N
12	Y Velocity	ydot	Scaled	NM/Sec	-0.25..0.25	1/65536	N
13	Altitude Acceleration	alt_accel	Scaled	Ft/Sec/Sec	-160..160	1/8	N
14	Track Predicted Azimuth	azimuth	Scaled	ACP	0..4096	1/16	N
15	Track Predicted Range	range	Scaled	NM	0..256	1/256	N
16	Reported Beacon Code	rbc	Int	N/A	0..07777	1	N
17	Track Speed	speed	Scaled	NM/sec	0..0.25	1/65536	N
18	Track Number	trk_num	Int	N/A	1..TQi	1	Y
19	Pseudo Track	pseudo_trk	Boolean	N/A	0..1	N/A	N
20	16 bit pad	pad1	Int	N/A	0	N/A	N
21	Altitude Firmness	alt_firm	Int	N/A	0..17	N/A	N
22	Altitude History	alt_sld_window	Encoded	N/A	0..0377	N/A	N
23	Track Firmness Value	firmness	Int	N/A	0..39	N/A	N
24	Parrot Track Indicator	parrot_trk	Int	N/A	0..MAX_RSM	1	N
25	Principal Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
26	Track Usage Status	status_ut	Enum	N/A	N/A	N/A	N
27	Track Class	tr_class	Enum	N/A	N/A	N/A	N
28	Mode 3A (RBC) Validity	va	Enum	N/A	0..3	N/A	N
29	Mode C (altitude) Validity	vc	Enum	N/A	0..3	N/A	N

30	Beacon Correlation	bcn_corl	Boolean	N/A	0..1	N/A	N
31	Deviation Trial Track	deviat	Boolean	N/A	0..1	N/A	N
32	Drop BCID Request	drop_bcid	Boolean	N/A	0..1	N/A	N
33	Emergency Indicator	em	Boolean	N/A	0..1	N/A	N
34	Initial Track Indicator	initial	Boolean	N/A	0..1	N/A	N
35	No Altitude	no_alt	Boolean	N/A	0..1	N/A	N
36	No RBC	no_rbc	Boolean	N/A	0..1	N/A	N
37	Radar Correlation	rdr_corl	Boolean	N/A	0..1	N/A	N
38	Radar Only Track	rdr_only_trk	Boolean	N/A	0..1	N/A	N
39	Special Position Ident	spi	Boolean	N/A	0..1	N/A	N
40	Terminate Requested	term_req	Boolean	N/A	0..1	N/A	N
41	Training Status	tng	Boolean	N/A	0..1	N/A	N
42	Unreasonable Mode C	un_modec	Boolean	N/A	0..1	N/A	N
43	Valid Altitude	valid_alt	Boolean	N/A	0..1	N/A	N
44	8 bit pad for 32 bit boundary	pad[2]	uns8	N/A	0	N/A	N

Table 20.3.5.1.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1390	uns16	1	31-16
2	Submessage Length	Message Length = 72 bytes	uns16	1	15-0
3	Predicted Altitude - Uncorrected		int32	2	31-0
4	Reported Altitude - Corrected		int32	3	31-0
5	Smoothed Altitude - Uncorrected		int32	4	31-0
6	Time of Last Correlation (zulu msecs)		uns32	5	31-0
7	Altitude Correction Factor		int16	6	31-16
8	Altitude Velocity		int16	6	15-0
9	Track Reported X Coord		int16	7	31-16
10	Track Reported Y Coord		int16	7	15-0
11	X Velocity		int16	8	31-16
12	Y Velocity		int16	8	15-0
13	Altitude Acceleration		int16	9	31-16
14	Track Predicted Azimuth		uns16	9	15-0
15	Track Predicted Range		uns16	10	31-16
16	Reported Beacon Code		uns16	10	15-0
17	Track Speed		uns16	11	31-16
18	Track Number		uns16	11	15-0
19	Pseudo Track		uns16	12	31-16
20	16 bit pad		uns16	12	15-0
21	Altitude Firmness		uns8	13	31-24
22	Altitude History		uns8	13	23-16
23	Track Firmness Value		uns8	13	15-8
24	Parrot Track Indicator		uns8	13	7-0
25	Principal Sensor Number		uns8	14	31-24
26	Track Usage Status		uns8	14	23-16
27	Track Class		uns8	14	15-8
28	Mode 3A (RBC) Validity		uns8	14	7-0
29	Mode C (altitude) Validity		uns8	15	31-24
30	Beacon Correlation		boolean	15	23-16
31	Deviation Trial Track		boolean	15	15-8
32	Drop BCID Request		boolean	15	7-0
33	Emergency Indicator		boolean	16	31-24
34	Initial Track Indicator		boolean	16	23-16
35	No Altitude		boolean	16	15-8
36	No RBC		boolean	16	7-0
37	Radar Correlation		boolean	17	31-24
38	Radar Only Track		boolean	17	23-16
39	Special Position Ident		boolean	17	15-8
40	Terminate Requested		boolean	17	7-0
41	Training Status		boolean	18	31-24
42	Unreasonable Mode C		boolean	18	23-16
43	Valid Altitude		boolean	18	15-8
44	8 bit pad for 32 bit boundary		uns8	18	7-0

20.3.5.2 AMASS Delete Flight Data Msg (m_amass_d_fp)

External form of the Delete Flight Data Msg (1809). This submessage is sent whenever the CP sets an FDF record to unused. It is used to inform the DP to set the corresponding FDF record to unused status.

Table 20.3.5.2.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
3	Record number in CP FDF	fp_nbr	Int	N/A	1..MAX_FDFQ	1	Y
4	Sensor number	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	1	N
5	Live/training track indicator	training	Boolean	N/A	0..1	N/A	N

Table 20.3.5.2.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1361	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	Record number in CP FDF		uns16	2	31-16
4	Sensor number		uns8	2	15-8
5	Live/training track indicator		boolean	2	7-0

20.3.5.3 AMASS Delete Track Msg (m_amass_dtm)

External form of the Delete Track Msg (1704). This message is sent whenever the TPS sets a track slot to unused. The Delete Track Msg is used to inform the DP and CP to set the corresponding track slot to unused status. This submessage is recorded by CDR when either the TA or TU extraction class is enabled.

Table 20.3.5.3.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUBMSGL	1	Y
3	Track Number	trk_num	Int	N/A	1..TQi	1	Y
4	Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
5	Subordinate Sensor Number	sub_sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y

Table 20.3.5.3.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1362	uns16	1	31-16
2	Submessage Length	Message Length = 8 bytes	uns16	1	15-0
3	Track Number		uns16	2	31-16
4	Sensor Number		uns8	2	15-8
5	Subordinate Sensor Number		uns8	2	7-0

20.3.5.4 AMASS Flight Plan Maintenance Msg (m_amass_afpm)

External Form of the Flight Plan Maintenance Msg (1800). This submessage is sent for each active associated track. It contains the current flight plan information. This submessage is transmitted each scan to permit initialization of any display within one scan. This submessage is recorded by CDR when the TA extraction class is enabled.

The Interfacility Message Types for a flight plan are as follows:

CF_NOSTATUS	0	No Interfacility Status
CF_DA	1	DA
CF_DX	2	DX
CF_DR	3	DR
CF_DT	4	DT
CF_TR	5	TR
CF_TB	6	TB
CF_DM	7	DM
CF_TU	8	TU
CF_TI	9	TI
CF_TA	10	TA
CF_FP	11	FP
CF_AM	12	AM
CF_CX	13	CX
CF_TL	14	TL
CF_TM	15	TM
CF_TN	16	TN
CF_RF	17	RF
CF_TS	18	TS
CF_TP	19	TP
CF_TZ	20	TZ
CF_VFRFP	21	VFR FP
CF_ARSAFP	22	ARSA FP
CF_MIDTU	23	Middle TU
CF_ENDTU	24	End TU

CF_EXPFP 25 Expect FP

CF_EXPTU 26 Expect TU

Table 20.3.5.4.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Flight Plan Maintenance Msg code	code	Int	code	0..xFFFF	N/A	Y
2	Flight Plan Maintenance Msg length	lgth	Int	bytes	MAFPML	1	Y
3	Assigned beacon code	abc	Int	N/A	0..07777	N/A	N
4	Active controller	act_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y
5	Auto-handoff altitude	aho_alt	Int	feet	0..995	100 ft.	N
6	Track requested altitude	alt_req	Int	feet	-99..999	100 ft.	N
7	Flight Plan assigned altitude	asg_alt	Int	feet	0..999	100 ft.	N
8	ETA/PTD in minutes since midnight	eta_ptd	Int	minutes	0..60*24-1	1	N
9	FDF Number	fdf_num	Int	N/A	1..MAX_FDFQ	N/A	N
10	Directed Handoff controller	ho_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
11	IF message number	if_msgno	Int	N/A	1..999	N/A	N
12	IF message time delta	if_msgtime_delt a	Int	seconds	0..65535	1	N
13	IF TU time delta	if_tutime_delta	Int	seconds	0..65535	1	N
14	Old Primary Controller	old_pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
15	Primary controller	pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y
16	Run Down List	rund	Int	N/A	0..MAX_NUMKQ	N/A	N
17	Satellite List Azimuth	sat_list_azimuth	Int	degrees	0..359	1	N
18	Satellite List Range	sat_list_range	Int	NM	0..64	1	N
19	TCID	tcid	Int	N/A	1..999	N/A	N
20	TI/TA beacon code	tita_bcn	Int	N/A	0..07777	N/A	N
21	Track number (per sensor)	track_nbr[[MAX _SENSQ]=1]	Int	N/A	0..TQi	N/A	N
22	Track number (per sensor)	track_nbr[[MAX _SENSQ]= 15]	Int	N/A	0..TQi	N/A	N
23	Sensor link/no link indicator (per sensor)	link[[MAX_SE NSQ]=1]	Boolean	N/A	0..1	N/A	N
24	Sensor real/pseudo link indicator (per sensor)	pseudo[[MAX_ SENSQ]=1]	Boolean	N/A	0..1	N/A	N
25	Sensor link/no link indicator (per sensor)	link[[MAX_SE NSQ]= 15]	Boolean	N/A	0..1	N/A	N
26	Sensor real/pseudo link indicator (per sensor)	pseudo[[MAX_ SENSQ]= 15]	Boolean	N/A	0..1	N/A	N
27	Assigned beacon code status	abc_stat	Enum	N/A	0..2	N/A	N
28	ACID number of non-space chars	acid_non_space	Int	N/A	2..7	N/A	N
29	Aircraft category	ac_cat	ASCII	N/A	H/T/B/F/L	N/A	N
30	Original Aircraft category	orig_ac_cat	ASCII	N/A	H/T/B/F/L/V/U/W	N/A	N
31	Arrival/Departure/Enroute status	ade_stat	Enum	N/A	0..255	N/A	Y
32	Auto-handoff index	aho_ind	Int	N/A	-1..127	N/A	N
33	Adjacent ARTS ID	arts_id	Int	N/A	0..MAX_NO_FACIL	N/A	N
34	Aircraft type disp counter	atcc	Int	scans	0..7	1	N

35	BRITE List Nr by Geo Area	brite_list_nbr[[MAX_GEO_BRITE]=1]	Int	N/A	0..MAX_BRT_LIST	1	N
36	BRITE List Nr by Geo Area	brite_list_nbr[[MAX_GEO_BRITE]= 8]	Int	N/A	0..MAX_BRT_LIST	1	N
37	Flight plan adaptor number	fpa	Int	N/A	0..3	1	N
38	FP status controlled VFR flight	fpstatus	Enum	N/A	0..2	N/A	Y
39	Handoff Countdown	ho_cntdn	Int	N/A	0..63	N/A	N
40	Handoff status	ho_stat	Enum	N/A	0..IF_HO_2_ARTCC	N/A	Y
41	Count of DX messages received	if_dx	Int	N/A	0..IF_ITRQ	N/A	N
42	Count of attempts to send a msg	if_msgcount	Int	N/A	0..IF_MAX_RETRY	N/A	N
43	ARTCC sector handing off to	if_sector	INt	N/A	0..31	N/A	N
44	ARTCC site messages are sent to	if_site	Int	N/A	0..3	N/A	N
45	IF message status	if_stat	Enum	N/A	0..24	N/A	N
46	Keyboard subset	kbd_subset	Int	N/A	1..7	N/A	N
47	Leader direction from change req	ldr_dir	Enum	N/A	0..7	N/A	N
48	Active radar subsystem	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	N/A	N
49	Track type	status_tp	Enum	N/A	0..3	N/A	N
50	Track usage status	status_ut	Enum	N/A	1..3	N/A	N
51	Tab coast out-of-range tracks	tab_or	Enum	N/A	0.2.3	N/A	N
52	Display number for VFR list	vfr_dsp_nbr	Int	N/A	1..MAX_NUMDQ	N/A	N
53	VFR fp stat	vfr_fp_stat	Enum	N/A	0..3	N/A	N
54	4 Aircraft type characters	ac_type[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
55	4 Aircraft type characters	ac_type[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
56	Track assigned altitude	alt_asg[[4]=1]	ASCII	ft	NULL 001..999	100 ft	N
57	Track assigned altitude	alt_asg[[4]= 4]	ASCII	ft	NULL 001..999	100 ft	N
58	Symbol and Subset of ART-ART UHO	art2art_uho[[2]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
59	Symbol and Subset of ART-ART UHO	art2art_uho[[2]=2]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
60	ARTS to ARTS symbol	atoa_sym	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
61	Airport and SS entry fixes	entry_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
62	Airport and SS entry fixes	entry_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
63	Airport and SS exit fixes	exit_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
64	Airport and SS exit fixes	exit_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
65	Exit Fix characters	exitfix_char[[MAX_AREA_LEVELS]=1]	ASCII	N/A	'A'-'Z'	N/A	N
66	Exit Fix characters	exitfix_char[[MAX_AREA_LEVELS]= 10]	ASCII	N/A	'A'-'Z'	N/A	N
67	8 Aircraft ID characters	fid[[8]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
68	8 Aircraft ID characters	fid[[8]= 8]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
69	Fix Pair Scratch Pad	fixpair_scratpad[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
70	Fix Pair Scratch Pad	fixpair_scratpad[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
71	ECID (ddA)	if_ecid[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N

72	ECID (ddA)	if_ecid[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
73	TCID of other ARTS site	if_tcid[[3]=1]	ASCII	N/A	'0'-'9'	N/A	N
74	TCID of other ARTS site	if_tcid[[3]= 3]	ASCII	N/A	'0'-'9'	N/A	N
75	Keyboard symbol	kybdsymb	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
76	Satellite airport symbol	sat_apt	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
77	Scratch Pad 1 Characters	scratch_pad[[3]= 1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
78	Scratch Pad 1 Characters	scratch_pad[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
79	Scratch Pad 2 Characters	scratch_pad2[[3] =1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
80	Scratch Pad 2 Characters	scratch_pad2[[3] = 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
81	Site adapted alpha character	sitechar	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
82	Tabular line identifier	tablinid	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	Y
83	VFR FP Tab Line Identifier	vfrfp_linid	ASCII	N/A	'0'-'9' space	N/A	N
84	Auto-acquire flag	aa	Boolean	N/A	0..1	N/A	N
85	Assigned Altitude flag	asng_alt	Boolean	N/A	0..1	N/A	N
86	BRITE eligibility indicator	brite_eligib	Boolean	N/A	0..1	N/A	N
87	Inhibit CA single trk ind	cai_inh_proc	Boolean	N/A	0..1	N/A	N
88	Inhibt CA ind for trk pair	cai_pair	Boolean	N/A	0..1	N/A	N
89	VFR beacon code inhib indicator	cai_vfr_rbc	Boolean	N/A	0..1	N/A	N
90	CA inhibit zone suppress	cai_zone_sup	Boolean	N/A	0..1	N/A	N
91	Scratchpad change for CTAS	chg_scratpad	Boolean	N/A	0..1	N/A	N
92	CA alert display indicator	disp_ca	Boolean	N/A	0..1	N/A	N
93	MSAW Climb indicator	disp_climb	Boolean	N/A	0..1	N/A	N
94	Display DB indicator	disp_db	Boolean	N/A	0..1	N/A	N
95	Display DM indicator	disp_dm	Boolean	N/A	0..1	N/A	N
96	Display/retain FDB indicator	disp_fdb	Boolean	N/A	0..1	N/A	N
97	Display blinking FP indicator	disp_fp	Boolean	N/A	0..1	N/A	N
98	Display blinking IF indicator	disp_if	Boolean	N/A	0..1	N/A	N
99	MSAW warning indictor	disp_la	Boolean	N/A	0..1	N/A	N
100	Display interfacility NAT ind	disp_nat	Boolean	N/A	0..1	N/A	N
101	Display OLD indicator	disp_old	Boolean	N/A	0..1	N/A	N
102	Display Pointout indicator	disp_po	Boolean	N/A	0..1	N/A	N
103	Emer/radio fail/hijack indicator	em	Boolean	N/A	0..1	N/A	N
104	Exit Fix is Primary Airport ind	exitfix_is_pri_ap t	Boolean	N/A	0..1	N/A	N
105	Flashing ABC indicator	flash_abc	Boolean	N/A	0..1	N/A	N
106	Forced control change	force_ctl_chg	Boolean	N/A	0..1	N/A	N
107	Freeze full data block indicator	frz_fdb	Boolean	N/A	0..1	N/A	N
108	Global leader dir ind F7 L dd	global_ldr	Boolean	N/A	0..1	N/A	N
109	Heavy aircraft indicator	heavy	Boolean	N/A	0..1	N/A	N
110	Interfacility handoff complete	ho_comp	Boolean	N/A	0..1	N/A	N
111	Inhibit auto acquisition	iaa	Boolean	N/A	0..1	N/A	N
112	Interfacility late hand-off	iaf_lho	Boolean	N/A	0..1	N/A	N

	ind						
113	IF ARSA Indicator	if_arsa	Boolean	N/A	0..1	N/A	N
114	IF AHO inhibited (delta) flag	if_delta	Boolean	N/A	0..1	N/A	N
115	IF late handoff indicator	if_lho	Boolean	N/A	0..1	N/A	N
116	Inhibit a/c type indicatr	inhactyp	Boolean	N/A	0..1	N/A	N
117	Inhibit Mode C altitude	inhmodec	Boolean	N/A	0..1	N/A	N
118	Inhibit AMB indicator	inh_amb	Boolean	N/A	0..1	N/A	N
119	Inhibit blinking HO	inh_bho	Boolean	N/A	0..1	N/A	N
120	Inhibit auto-handoff	inh_ifaho	Boolean	N/A	0..1	N/A	N
121	Display intrafacility NAT ind	intra_nat	Boolean	N/A	0..1	N/A	N
122	MSAW alert display indicator	lai_inh_disp	Boolean	N/A	0..1	N/A	N
123	Inhibit MSAW processing ind	lai_inh_proc	Boolean	N/A	0..1	N/A	N
124	Leader Direction Change Request	ldr_dir_chg	Boolean	N/A	0..1	N/A	N
125	Out of range indicator	outofrng	Boolean	N/A	0..1	N/A	N
126	Radar only flight plan indicator	rdr_only	Boolean	N/A	0..1	N/A	N
127	Ring remote MSAW alarm	remote_alarm	Boolean	N/A	0..1	N/A	N
128	MSAW alarm indicator	ring_msaw	Boolean	N/A	0..1	N/A	N
129	Satellite List Entry	sat_list_entry	Boolean	N/A	0..1	N/A	N
130	Suspend out-of-range indicator	sdor	Boolean	N/A	0..1	N/A	N
131	Unused	unused3	Boolean	N/A	0..1	N/A	N
132	Track active status	status_a	Boolean	N/A	0..1	N/A	N
133	Suspend trk trk/not trk	susp_trk_not_trk	Boolean	N/A	0..1	N/A	N
134	Suspend track special symbol	sus_trk_sym	Boolean	N/A	0..1	N/A	N
135	TA beacon code received	taval	Boolean	N/A	0..1	N/A	N
136	TI beacon code received	tival	Boolean	N/A	0..1	N/A	N
137	Live/training track indicator	tng	Boolean	N/A	0..1	N/A	N
138	VFR Fix intermediate flag	vfrfp_fixint	Boolean	N/A	0..1	N/A	N
139	VFR fp originated at ARTS	vfr_arts	Boolean	N/A	0..1	N/A	N
140	VFR flight plan	vfr_fp	Boolean	N/A	0..1	N/A	N
141	Zone/floor suppress indicator	zone_sup	Boolean	N/A	0..1	N/A	N

Table 20.3.5.4.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Flight Plan Maintenance Msg code	Message Code = 1363	uns16	1	31-16
2	Flight Plan Maintenance Msg length	Message Length = 248 bytes	uns16	1	15-0
3	Assigned beacon code		uns16	2	31-16
4	Active controller		uns16	2	15-0
5	Auto-handoff altitude		uns16	3	31-16
6	Track requested altitude		int16	3	15-0
7	Flight Plan assigned altitude		int16	4	31-16
8	ETA/PTD in minutes since midnight		uns16	4	15-0
9	FDF Number		uns16	5	31-16
10	Directed Handoff controller		uns16	5	15-0
11	IF message number		uns16	6	31-16
12	IF message time delta	(seconds)	uns16	6	15-0
13	IF TU time delta	(seconds)	uns16	7	31-16
14	Old Primary Controller		uns16	7	15-0
15	Primary controller		uns16	8	31-16
16	Run Down List		uns16	8	15-0
17	Satellite List Azimuth	from airport	uns16	9	31-16
18	Satellite List Range	from airport	uns16	9	15-0
19	TCID		uns16	10	31-16
20	TI/TA beacon code		uns16	10	15-0
21	Track number (per sensor)		uns16	11	31-16
22	Track number (per sensor)		uns16	18	31-16
23	Sensor link/no link indicator	These [Fields = 2] are repeated [[MAX_SENSQ] =1] times	boolean	18	15-8
24	Sensor real/pseudo link indicator		boolean	18	7-0
25	Sensor link/no link indicator	These [Fields = 2] are repeated [[MAX_SENSQ] = 15] times	boolean	25	15-8
26	Sensor real/pseudo link indicator		boolean	25	7-0
27	Assigned beacon code status	ABC_EXISTS(0)=assigned TENT_ABC(1)=tentative assigned NO_ABC(2)=no assigned	uns8	26	31-24
28	ACID number of non-space chars		uns8	26	23-16
29	Aircraft category		uns8	26	15-8
30	Original Aircraft category		uns8	26	7-0
31	Arrival/Departure/Enroute status	Must be ADE_OVERFLIGHT or ADE_ARR_UNKNOWN..ADE_ARRU or ADE_DEP_UNKNOWN..ADEPU	uns8	27	31-24
32	Auto-handoff index		int8	27	23-16
33	Adjacent ARTS ID		uns8	27	15-8
34	Aircraft type disp counter		uns8	27	7-0
35	BRITE List Nr by Geo Area		uns8	28	31-24
36	BRITE List Nr by Geo Area		uns8	29	7-0

37	Flight plan adaptor number		uns8	30	31-24
38	FP status controlled VFR flight	0 = IFR1 = VFR2 = VFR_ON_TOP	uns8	30	23-16
39	Handoff Countdown		uns8	30	15-8
40	Handoff status	0=not in handoff 1=intrafacility countdown 2=interfacility countdown 3=intrafacility 4=to ARTCC 5=from ARTCC	uns8	30	7-0
41	Count of DX messages received		uns8	31	31-24
42	Count of attempts to send a msg		uns8	31	23-16
43	ARTCC sector handing off to		uns8	31	15-8
44	ARTCC site messages are sent to		uns8	31	7-0
45	IF message status	See text	uns8	32	31-24
46	Keyboard subset		uns8	32	23-16
47	Leader direction from change req	LDR_N(0)=North LDR_NE(1)=Northeast LDR_E(2)=EastLDR_SE(3)=Southeast LDR_S(4)=South LDR_SW(5)=Southwest LDR_W(6)=WestLDR_NW(7)=Northwest	uns8	32	15-8
48	Active radar subsystem		uns8	32	7-0
49	Track type	0=store 1=tab coast 2=suspend not tracking 3=suspend	uns8	33	31-24
50	Track usage status	ASSOCIATED(1)=associated UNASSOCIATED(3)=unassociated	uns8	33	23-16
51	Tab coast out-of-range tracks	0=not OR 2=OR 3=blinking OR	uns8	33	15-8
52	Display number for VFR list		uns8	33	7-0
53	VFR fp stat	0=VFR 1=FIX 2=IFP	uns8	34	31-24
54	4 Aircraft type characters		char	34	23-16
55	4 Aircraft type characters		char	35	31-24
56	Track assigned altitude		char	35	23-16
57	Track assigned altitude		char	36	31-24
58	Symbol and Subset of ART-ART UHO		char	36	23-16
59	Symbol and Subset of ART-ART UHO		char	36	15-8
60	ARTS to ARTS symbol		char	36	7-0
61	Airport and SS entry fixes		char	37	31-24
62	Airport and SS entry fixes		char	37	7-0
63	Airport and SS exit fixes		char	38	31-24
64	Airport and SS exit fixes		char	38	7-0
65	Exit Fix characters		char	39	31-24
66	Exit Fix characters		char	41	23-16
67	8 Aircraft ID characters		char	41	15-8
68	8 Aircraft ID characters		char	43	23-16
69	Fix Pair Scratch Pad		char	43	15-8
70	Fix Pair Scratch Pad		char	44	31-24
71	ECID (ddA)		char	44	23-16

72	ECID (ddA)		char	44	7-0
73	TCID of other ARTS site		char	45	31-24
74	TCID of other ARTS site		char	45	15-8
75	Keyboard symbol		char	45	7-0
76	Satellite airport symbol		char	46	31-24
77	Scratch Pad 1 Characters		char	46	23-16
78	Scratch Pad 1 Characters		char	46	7-0
79	Scratch Pad 2 Characters		char	47	31-24
80	Scratch Pad 2 Characters		char	47	15-8
81	Site adapted alpha character		char	47	7-0
82	Tabular line identifier		char	48	31-24
83	VFR FP Tab Line Identifier		char	48	23-16
84	Auto-acquire flag		boolean	48	15-8
85	Assigned Altitude flag		boolean	48	7-0
86	BRITE eligibility indicator		boolean	49	31-24
87	Inhibit CA single trk ind		boolean	49	23-16
88	Inhibt CA ind for trk pair		boolean	49	15-8
89	VFR beacon code inhib indicator		boolean	49	7-0
90	CA inhibit zone suppress		boolean	50	31-24
91	Scratchpad change for CTAS		boolean	50	23-16
92	CA alert display indicator		boolean	50	15-8
93	MSAW Climb indicator		boolean	50	7-0
94	Display DB indicator		boolean	51	31-24
95	Display DM indicator		boolean	51	23-16
96	Display/retain FDB indicator		boolean	51	15-8
97	Display blinking FP indicator		boolean	51	7-0
98	Display blinking IF indicator		boolean	52	31-24
99	MSAW warning indictor		boolean	52	23-16
100	Display interfacility NAT ind		boolean	52	15-8
101	Display OLD indicator		boolean	52	7-0
102	Display Pointout indicator		boolean	53	31-24
103	Emer/radio fail/hijack indicator		boolean	53	23-16
104	Exit Fix is Primary Airport ind		boolean	53	15-8
105	Flashing ABC indicator		boolean	53	7-0
106	Forced control change		boolean	54	31-24
106	Freeze full data block indicator		boolean	54	23-16
108	Global leader dir ind F7 L dd		boolean	54	15-8
109	Heavy aircraft indicator		boolean	54	7-0
110	Interfacility handoff complete		boolean	55	31-24
111	Inhibit auto acquisition		boolean	55	23-16
112	Interfacility late hand-off ind		boolean	55	15-8

113	IF ARSA Indicator		boolean	55	7-0
114	IF AHO inhibited (delta) flag		boolean	56	31-24
115	IF late handoff indicator		boolean	56	23-16
116	Inhibit a/c type indicatr		boolean	56	15-8
117	Inhibit Mode C altitude		boolean	56	7-0
118	Inhibit AMB indicator		boolean	57	31-24
119	Inhibit blinking HO		boolean	57	23-16
120	Inhibit auto-handoff		boolean	57	15-8
121	Display intrafacility NAT ind		boolean	57	7-0
122	MSAW alert display indicator		boolean	58	31-24
123	Inhibit MSAW processing ind		boolean	58	23-16
124	Leader Direction Change Request		boolean	58	15-8
125	Out of range indicator		boolean	58	7-0
126	Radar only flight plan indicator		boolean	59	31-24
127	Ring remote MSAW alarm		boolean	59	23-16
128	MSAW alarm indicator		boolean	59	15-8
129	Satellite List Entry		boolean	59	7-0
130	Suspend out-of-range indicator		boolean	60	31-24
131	Unused3		boolean	60	23-16
132	Track active status		boolean	60	15-8
133	Suspend trk trk/not trk		boolean	60	7-0
134	Suspend track special symbol		boolean	61	31-24
135	TA beacon code received		boolean	61	23-16
136	TI beacon code received		boolean	61	15-8
137	Live/training track indicator		boolean	61	7-0
138	VFR Fix intermediate flag		boolean	62	31-24
139	VFR fp originated at ARTS		boolean	62	23-16
140	VFR flight plan		boolean	62	15-8
141	Zone/floor suppress indicator		boolean	62	7-0

20.3.5.5 AMASS Heartbeat Msg (m_amass_fast_hbeat)

External form of the AGW Heartbeat Msg (1301). This submessage is sent by the AMASS CSCI once per second. It contains the AMASS process state and the current system time. The AMASS State contains one of the following values:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

Table 20.3.5.5.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	Current System Time within day	system_time	Int	msec	0..86399999	1	Y
4	Day of Year	day_of_year	Int	N/A	1..366	N/A	Y
5	Four digits - year	year	Int	N/A	1970..2037	N/A	Y
6	FAST State (see text)	fast_state	Enum	N/A	0..3	N/A	N
7	Pad msg to multiple of 32 bits	pad[3]	char	N/A	N/A	N/A	N

Table 20.3.5.5.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1364	uns16	1	31-16
2	Submessage length	Message Length = 16 bytes	uns16	1	15-0
3	Current System Time within day		uns32	2	31-0
4	Day of Year		uns16	3	31-16
5	Four digits - year		uns16	3	15-0
6	CTIS State (see text)		uns8	4	31-24
7	Pad msg to multiple of 32 bits		uns8	4	23-0

20.3.5.6 AMASS PC Heartbeat Msg (m_amass_hbeat)

This submessage is sent to the AGW once per second by the AMASS PC. The CTIS CSCI will process this message to determine the presence of the AMASS PC and the condition of the interconnecting network link.

The AMASS State field contains one of the following values representing the state of the AMASS PC:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

Table 20.3.5.6.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	AMASS State (see text)	amass_state	Enum	N/A	0..3	N/A	N
4	Pad msg to multiple of 32 bits	pad[3]	char	N/A	N/A	N/A	N

Table 20.3.5.6.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1365	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	AMASS State (see text)		uns8	2	31-24
4	Pad msg to multiple of 32 bits		uns8	2	23-0

20.3.5.7 AMASS Altimeter and DASI Msg for AMASS (m_alt_dasi)

This message is sent to AMASS to transfer the altimeter and DASI information to the AMASS PC. This message is derived from data contained in the TP Heartbeat message (msg1708). It is sent every half second upon receipt of a new TP Heartbeat message to the AMASS PC.

Table 20.3.5.7.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
3	Current Altimeter Setting	altimeter_value [[1][2]]	uns16	Inches	27..32	1/512	N
4	Current Altimeter Setting	altimeter_value [[10][2]]	uns16	Inches	27..32	1/512	N
5	Time Altitude Was Updated	altimeter_time [[1][2]]	uns16	Minutes	0..1439	1	N
6	Time Altitude Was Updated	altimeter_time [[10][2]]	uns16	Minutes	0..1439	1	N
7	DASI Status	dasi_status [[1][11]]	Boolean	N/A	0..1	N/A	N
8	DASI Status	dasi_status [[3][11]]	Boolean	N/A	0..1	N/A	N
9	Status Of Altimeter Data	altimeter_status [[1][2]]	char	N/A	N/A	N/A	N
10	Status Of Altimeter Data	altimeter_status [[10][2]]	char	N/A	N/A	N/A	N
11	Raw Altimeter Characters	raw_altim_chars [[1][2][4]]	char	N/A	N/A	N/A	N
12	Raw Altimeter Characters	raw_altim_chars [[10][2][4]]	char	N/A	N/A	N/A	N
13	32bit Boundary Formatter	pad1[3]	uns8	N/A	0	N/A	N

Table 20.3.5.7.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1367	uns16	1	31-16
2	Submessage length	Message Length = 220 bytes	uns16	1	15-0
3	Current Altimeter Setting	altimeter_value [[MAX_ALSTGS][2]]	uns16	2	31-16
4	Current Altimeter Setting		uns16	11	15-0
5	Time Altitude Was Updated	altimeter_time [[MAX_ALSTGS][2]]	uns16	12	31-16
6	Time Altitude Was Updated		uns16	21	15-0
7	DASI Status	dasi_status [[MAX_CPS][MAX_DASI+1]]	Boolean	22	31-24
8	DASI Status		Boolean	30	31-24
9	Status Of Altimeter Data	altimeter_status [[MAX_ALSTGS][2]]	char	30	23-16
10	Status Of Altimeter Data		char	35	31-24
11	Raw Altimeter Characters	raw_altim_chars [[MAX_ALSTGS][2][4]]	char	35	23-16
12	Raw Altimeter Characters		char	55	31-24
13	32bit Boundary Formatter	pad1[3]	uns8	55	23-0

Section 21
ATLANTA RESOURCE MANAGEMENT TOOL INTERFACE

21.1 GENERAL DESCRIPTION

The Atlanta Resource Management Tool Interface provides tracking and flight plan information to external data collection and analysis tools. Common ARTS provides this interface through a generic firewall capability through the use of an ARTS Interface Gateway (AGW). The AGW runs various processes to interface and convert messages between Common ARTS and other equipment and acts to isolate the external equipment from the operational local area networks. An implementation of the Common Terminal Interface Software (CTIS) is used to convert the current Common ARTS messages to an external form used by the Atlanta Resource Management Tool.

21.2 REFERENCED DOCUMENTS

21.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

21.2.1.1 Applicable Government Documents

Specifications

ATC 60050	Common ARTS Interface Design Document

Standards

None.

Other Publications

None.

21.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

FIPS PUB 160	American National Standard for Information Systems - Programming Language – C
ANSI/IEEE Standard 802.3 -	Institute of Electrical and Electronic Engineers-Local Area Networks International Standards Organization (ISO) Open System Interconnect (OSI) Reference Mode and ISO Communication Protocol Standards.
IETF STD-0005	Internet Protocol, September 1981
IETF STD-0007	Transmission Control Protocol, September 1981
IETF STD-0041	Standard for the transmission of IP datagrams over Ethernet networks, April 1984

Other Publications

None.

21.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993.

FAA Computer Program Functional Specifications

ARTS NAS-MD-634, A6.05/A2.09	System Description and Specified Series, Final, Rev. A, November 1997
ARTS NAS-MD-638, A6.05/A2.09	Keyboard, Final, Rev. A, November 1997
ARTS NAS-MD-639, A6.05/A2.09	Display Output Processing and Converging Runway Display Aid (CRDA), Final, Rev. A, November 1997
ARTS NAS-MD-642, A6.05/A2.09	Error and Status Messages, Final, Rev. A, November 1997
ARTS NAS-MD-643, A6.05/A2.09	Site Adaptation, Final, Rev. A, November 1997
ARTS NAS-MD-646, A6.05/A2.09	CDR Editor, RETRACK and Disk/File Utilities, Final, Rev. A, November 1997
ARTS NAS-MD-648, A6.05/A2.09	Continuous Data Recording Processing and Performance Monitoring, Final, Rev. A, November 1997

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

21.3 ATLANTA RESOURCE MANAGEMENT TOOL

21.3.1 General Information

The Common ARTS Interface to the Atlanta Resource Management Tool Data Collection PC is through a 100 megabit per second ethernet running TCP/IP protocols. The ethernet interface in the AGW is used to communicate to the ethernet port on the ARMT PC. The AGW hardware in the IIIE system is made up of two VME Chassis's connected to two independent Cisco firewalls which are then connected to a hub. The AGW hardware in the IIE system is made up of a single PC connected directly to a hub.

21.3.2 Mechanical Characteristics

The ethernet connection on either the IIIE or IIE versions of the AGW are made of a RJ45 architecture. All the external systems that wish to interface to the Common ARTS system will use a RJ45 cable over a 10/100 Mbit connection to attach their computer to the same hub as that of the AGW.

21.3.3 Electrical Characteristics

The RJ45 interface that connects to the hub conforms to the industry standard layout defined for this interface. A 100 Mbit RJ45 connection is highly recommended to minimize 10Mbit bottlenecks on the network.

The PowerPC version of the AGW is a RJ45 10/100 connection into a CISCO Firewall/Router or directly into the AGW depending on site adaptation. Normal configuration is a RJ45(Cat. 5) connection into a Switch in route to a CISCO Firewall/Router(connected to the AGW), which conforms to the industry standard RJ45 10/100 Cat 5 configuration for this interface.

The Linux i86 version of the AGW is a RJ45 10/100 connection directly into the AGW or a 10/100 Switch(sites with multiple AGW clients) which conforms to the industry standard layout for this interface.

21.3.4 Network Protocol

The Atlanta Resource Management Tool interface to the Common ARTS system uses TCP/IP protocols. The Common Terminal Interface Software (CTIS) process running in the AGW acts as a TCP server listening on port **5095**. All data is passed in network byte order (big endian). The IP address for this interface is set in Common ARTS Adaptation and is physically set by CTIS when the program initializes.

Messages are passed to and from the Common ARTS AGW using a simple higher level protocol running on top of the TCP/IP. Each message consists of a 2 byte code field and 2 byte length field followed by one or more submessages. The length specifies the total length of all of the submessages including the 4 bytes for code and length that make up this message.

21.3.5 Data Format

The submessages each have a 2 byte submessage code and a 2 byte length followed by data specific to the submessage. The submessage length does include the length of the code and length fields thus no submessage can be less than 4 bytes long and likewise no message can be less than 4 bytes long.

Submessages from AGW to Atlanta Resource Management Tool PC

Submessage	Code
ARMT Active Track Maintenance Msg	0x1390
ARMT Delete Flight Data Msg	0x1391
ARMT Delete Track Msg	0x1392
ARMT Flight Plan Maintenance Msg	0x1393
ARMT Heartbeat Msg	0x1394
ARMT CDR Autofunction Msg	0x1398

Submessages from PC to AGW

Submessage	Code
ARMT PC Heartbeat Msg	0x1395

The detail structure of the submessages are described in the following sections. Typically, these structures are defined as C data structures that are included with the application program that processes the messages.

21.3.5.1 ARMT Active Track Maintenance Msg (m_armt_atm)

External form of Active Track Maintenance Msg (1700). The Active Track Maintenance (ATM) message is sent from various CSCIs to indicate to the receiving CSCIs that track data has been updated. It contains the updated track position, speed, altitude, etc. The ATM message is most commonly sent by TPS and received by CPS (for linking and FP association), DPS (for display), and SMON (for recording). It is sent once per track per scan via the Track Sensor Multiqueue.

ATMs come in two categories: "principal" and "subordinate". Principal ATMs are sent in the normal case (as described above) for all tracks in all sensors, including ARSRs. Subordinate ATM messages are used in the special case when a Display Sensor Switch command is entered and an ARSR is selected to backup a given ASR. When this condition is present, TPS adds data to the message to provide transformed XY coordinates (relative to the specific ASR) and sends the ATM again via another multiqueue. This additional multiqueue is named appropriately to define the specific ARSR-ASR combination. The sub_sensor field distinguishes Principal ATMs from Subordinate ATMs: IF sub_sensor == NULL_SENSOR, THEN this is a Principal ATM. The fields sub_rept_pos_x, sub_rept_pos_y, and sub_rep_range only have meaning in Subordinate ATMs.

Table 21.3.5.1.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUMMSGL	1	Y
3	Predicted Altitude - Uncorrected	pre_alt	Scaled	Feet	-1000..99900	1/8	N
4	Reported Altitude - Corrected	rep_alt	Scaled	Feet	-1000..99900	1/8	N
5	Smoothed Altitude - Uncorrected	smooth_alt	Scaled	Feet	-1000..99900	1/8	N
6	Time of Last Correlation (zulu msecs)	last_coorel	Int	msec	0..86399999	1	N
7	Altitude Correction Factor	alt_correction	Int	Feet	-1900..2900	1/8	N
8	Altitude Velocity	alt_veloc	Int	Feet/Sec	-1000..1000	1/8	N
9	Track Reported X Coord	rept_pos_x	Scaled	NM	-256..256	1/128	N
10	Track Reported Y Coord	rept_pos_y	Scaled	NM	-256..256	1/128	N
11	X Velocity	xdot	Scaled	NM/Sec	-0.25..0.25	1/65536	N
12	Y Velocity	ydot	Scaled	NM/Sec	-0.25..0.25	1/65536	N
13	Altitude Acceleration	alt_accel	Scaled	Ft/Sec/Sec	-160..160	1/8	N
14	Track Predicted Azimuth	azimuth	Scaled	ACP	0..4096	1/16	N
15	Track Predicted Range	range	Scaled	NM	0..256	1/256	N
16	Reported Beacon Code	rbc	Int	N/A	0..07777	1	N
17	Track Speed	speed	Scaled	NM/sec	0..0.25	1/65536	N
18	Track Number	trk_num	Int	N/A	1..TQi	1	Y
19	Pseudo Track	pseudo_trk	Boolean	N/A	0..1	N/A	N
20	16 bit pad	pad1	Int	N/A	0	N/A	N
21	Altitude Firmness	alt_firm	Int	N/A	0..17	N/A	N
22	Altitude History	alt_sld_window	Encoded	N/A	0..0377	N/A	N
23	Track Firmness Value	firmness	Int	N/A	0..39	N/A	N
24	Parrot Track Indicator	parrot_trk	Int	N/A	0..MAX_RSM	1	N
25	Principal Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
26	Track Usage Status	status_ut	Enum	N/A	N/A	N/A	N
27	Track Class	tr_class	Enum	N/A	N/A	N/A	N
28	Mode 3A (RBC) Validity	va	Enum	N/A	0..3	N/A	N
29	Mode C (altitude) Validity	vc	Enum	N/A	0..3	N/A	N

30	Beacon Correlation	bcn_corl	Boolean	N/A	0..1	N/A	N
31	Deviation Trial Track	deviat	Boolean	N/A	0..1	N/A	N
32	Drop BCID Request	drop_bcid	Boolean	N/A	0..1	N/A	N
33	Emergency Indicator	em	Boolean	N/A	0..1	N/A	N
34	Initial Track Indicator	initial	Boolean	N/A	0..1	N/A	N
35	No Altitude	no_alt	Boolean	N/A	0..1	N/A	N
36	No RBC	no_rbc	Boolean	N/A	0..1	N/A	N
37	Radar Correlation	rdr_corl	Boolean	N/A	0..1	N/A	N
38	Radar Only Track	rdr_only_trk	Boolean	N/A	0..1	N/A	N
39	Special Position Ident	spi	Boolean	N/A	0..1	N/A	N
40	Terminate Requested	term_req	Boolean	N/A	0..1	N/A	N
41	Training Status	tng	Boolean	N/A	0..1	N/A	N
42	Unreasonable Mode C	un_modec	Boolean	N/A	0..1	N/A	N
43	Valid Altitude	valid_alt	Boolean	N/A	0..1	N/A	N
44	8 bit pad for 32 bit boundary	pad[2]	uns8	N/A	0	N/A	N

Table 21.3.5.1.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1390	uns16	1	31-16
2	Submessage Length	Message Length = 72 bytes	uns16	1	15-0
3	Predicted Altitude - Uncorrected		int32	2	31-0
4	Reported Altitude - Corrected		int32	3	31-0
5	Smoothed Altitude - Uncorrected		int32	4	31-0
6	Time of Last Correlation (zulu msecs)		uns32	5	31-0
7	Altitude Correction Factor		int16	6	31-16
8	Altitude Velocity		int16	6	15-0
9	Track Reported X Coord		int16	7	31-16
10	Track Reported Y Coord		int16	7	15-0
11	X Velocity		int16	8	31-16
12	Y Velocity		int16	8	15-0
13	Altitude Acceleration		int16	9	31-16
14	Track Predicted Azimuth		uns16	9	15-0
15	Track Predicted Range		uns16	10	31-16
16	Reported Beacon Code		uns16	10	15-0
17	Track Speed		uns16	11	31-16
18	Track Number		uns16	11	15-0
19	Pseudo Track		uns16	12	31-16
20	16 bit pad		uns16	12	15-0
21	Altitude Firmness		uns8	13	31-24
22	Altitude History		uns8	13	23-16
23	Track Firmness Value		uns8	13	15-8
24	Parrot Track Indicator		uns8	13	7-0
25	Principal Sensor Number		uns8	14	31-24
26	Track Usage Status		uns8	14	23-16
27	Track Class		uns8	14	15-8
28	Mode 3A (RBC) Validity		uns8	14	7-0
29	Mode C (altitude) Validity		uns8	15	31-24
30	Beacon Correlation		boolean	15	23-16
31	Deviation Trial Track		boolean	15	15-8
32	Drop BCID Request		boolean	15	7-0
33	Emergency Indicator		boolean	16	31-24
34	Initial Track Indicator		boolean	16	23-16
35	No Altitude		boolean	16	15-8
36	No RBC		boolean	16	7-0
37	Radar Correlation		boolean	17	31-24
38	Radar Only Track		boolean	17	23-16
39	Special Position Ident		boolean	17	15-8
40	Terminate Requested		boolean	17	7-0
41	Training Status		boolean	18	31-24
42	Unreasonable Mode C		boolean	18	23-16
43	Valid Altitude		boolean	18	15-8
44	8 bit pad for 32 bit boundary		uns8	18	7-0

21.3.5.2 ARMT Delete Flight Data Msg (m_armt_d_fp)

External form of the Delete Flight Data Msg (1809). This submessage is sent whenever the CP sets an FDF record to unused. It is used to inform the DP to set the corresponding FDF record to unused status.

Table 21.3.5.2.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
3	Record number in CP FDF	fp_nbr	Int	N/A	1..MAX_FDFQ	1	Y
4	Sensor number	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	1	N
5	Live/training track indicator	training	Boolean	N/A	0..1	N/A	N

Table 21.3.5.2.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1391	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	Record number in CP FDF		uns16	2	31-16
4	Sensor number		uns8	2	15-8
5	Live/training track indicator		boolean	2	7-0

21.3.5.3 ARMT Delete Track Msg (m_armt_dtm)

External form of the Delete Track Msg (1704). This message is sent whenever the TPS sets a track slot to unused. The Delete Track Msg is used to inform the DP and CP to set the corresponding track slot to unused status. This submessage is recorded by CDR when either the TA or TU extraction class is enabled.

Table 21.3.5.3.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUBMSGL	1	Y
3	Track Number	trk_num	Int	N/A	1..TQi	1	Y
4	Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
5	32bit Boundary Pad	pad1	Int	N/A	0..MAX_SENSQ-1	N/A	Y

Table 21.3.5.3.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1392	uns16	1	31-16
2	Submessage Length	Message Length = 8 bytes	uns16	1	15-0
3	Track Number		uns16	2	31-16
4	Sensor Number		uns8	2	15-8
5	32bit Boundary Pad		uns8	2	7-0

21.3.5.4 ARMT Flight Plan Maintenance Msg (m_armt_afpm)

External Form of the Flight Plan Maintenance Msg (1800). This submessage is sent for each active associated track. It contains the current flight plan information. This submessage is transmitted each scan to permit initialization of any display within one scan. This submessage is recorded by CDR when the TA extraction class is enabled.

The Interfacility Message Types for a flight plan are as follows:

CF_NOSTATUS	0	No Interfacility Status
CF_DA	1	DA
CF_DX	2	DX
CF_DR	3	DR
CF_DT	4	DT
CF_TR	5	TR
CF_TB	6	TB
CF_DM	7	DM
CF_TU	8	TU
CF_TI	9	TI
CF_TA	10	TA
CF_FP	11	FP
CF_AM	12	AM
CF_CX	13	CX
CF_TL	14	TL
CF_TM	15	TM
CF_TN	16	TN
CF_RF	17	RF
CF_TS	18	TS
CF_TP	19	TP
CF_TZ	20	TZ
CF_VFRFP	21	VFR FP
CF_ARSAFP	22	ARSA FP
CF_MIDTU	23	Middle TU
CF_ENDTU	24	End TU

CF_EXPFP 25 Expect FP

CF_EXPTU 26 Expect TU

Table 21.3.5.4.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Flight Plan Maintenance Msg code	code	Int	code	0..xFFFF	N/A	Y
2	Flight Plan Maintenance Msg length	lgth	Int	bytes	MAFPML	1	Y
3	Assigned beacon code	abc	Int	N/A	0..07777	N/A	N
4	Active controller	act_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y
5	Auto-handoff altitude	aho_alt	Int	feet	0..995	100 ft.	N
6	Track requested altitude	alt_req	Int	feet	-99..999	100 ft.	N
7	Flight Plan assigned altitude	asg_alt	Int	feet	0..999	100 ft.	N
8	ETA/PTD in minutes since midnight	eta_ptd	Int	minutes	0..60*24-1	1	N
9	FDF Number	fdf_num	Int	N/A	1..MAX_FDFQ	N/A	N
10	Directed Handoff controller	ho_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
11	IF message number	if_msgno	Int	N/A	1..999	N/A	N
12	IF message time delta	if_msgtime_delta	Int	seconds	0..65535	1	N
13	Scratchpad 2 countdown time	if_scrpad2_secs	Int	seconds	0..65535	1	N
14	IF TU time delta	if_tutime_delta	Int	seconds	0..65535	1	N
15	Old Interfacility Controller	old_if_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
16	Old Primary Controller	old_pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
17	Primary controller	pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y
18	Pad	pad1	Int	N/A	N/A	N/A	N
19	TCID	tcid	Int	N/A	1..999	N/A	N
20	TI/TA beacon code	tita_bcn	Int	N/A	0..07777	N/A	N
21	Track number (per sensor)	track_nbr[[MAX_SENSQ]=1]	Int	N/A	0..TQi	N/A	N
22	Track number (per sensor)	track_nbr[[MAX_SENSQ]= 15]	Int	N/A	0..TQi	N/A	N
23	Redirect Controller	rd_cont	Int	N/A	0,,MAX_NUMKQ	N/A	N
24	Sensor link/no link indicator (per sensor)	link[[MAX_SENSQ]=1]	Boolean	N/A	0..1	N/A	N
25	Sensor real/pseudo link indicator (per sensor)	pseudo[[MAX_SENSQ]=1]	Boolean	N/A	0..1	N/A	N
26	32bit Alignment Pad	pad2[2] [[MAX_SENSQ]=1]	Int	N/A	N/A	N/A	N/A
27	Sensor link/no link indicator (per sensor)	link[[MAX_SENSQ]= 15]	Boolean	N/A	0..1	N/A	N
28	Sensor real/pseudo link indicator (per sensor)	pseudo[[MAX_SENSQ]= 15]	Boolean	N/A	0..1	N/A	N
29	32bit Alignment Pad	pad2[2] [[MAX_SENSQ]= 15]	Int	N/A	N/A	N/A	N/A
30	Assigned beacon code status	abc_stat	Enum	N/A	0..2	N/A	N
31	ACID number of non-space chars	acid_non_space	Int	N/A	2..7	N/A	N

32	Aircraft category	ac_cat	ASCII	N/A	H/T/B/F/L	N/A	N
33	Original Aircraft category	orig_ac_cat	ASCII	N/A	H/T/B/F/L/V/U/W	N/A	N
34	Arrival/Departure/Enroute status	ade_stat	Enum	N/A	0..255	N/A	Y
35	Auto-handoff index	aho_ind	Int	N/A	-1..127	N/A	N
36	Adjacent ARTS ID	arts_id	Int	N/A	0..MAX_NO_FACIL	N/A	N
37	Aircraft type disp counter	atcc	Int	scans	0..7	1	N
38	Flight plan adaptor number	fpa	Int	N/A	0..3	1	N
39	FP status controlled VFR flight	fpstatus	Enum	N/A	0..2	N/A	Y
40	Handoff Countdown	ho_cntdn	Int	N/A	0..63	N/A	N
41	Handoff status	ho_stat	Enum	N/A	0..IF_HO_2_ARTCC	N/A	Y
42	Count of DX messages received	if_dx	Int	N/A	0..IF_ITRQ	N/A	N
43	Count of attempts to send a msg	if_msgcount	Int	N/A	0..IF_MAX_RETRY	N/A	N
44	ARTCC sector handing off to	if_sector	INt	N/A	0..31	N/A	N
45	ARTCC site messages are sent to	if_site	Int	N/A	0..3	N/A	N
46	IF message status	if_stat	Enum	N/A	0..24	N/A	N
47	Keyboard subset	kbd_subset	Int	N/A	1..7	N/A	N
48	Leader direction from change req	ldr_dir	Enum	N/A	0..7	N/A	N
49	Active radar subsystem	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	N/A	N
50	Track type	status_tp	Enum	N/A	0..3	N/A	N
51	Track usage status	status_ut	Enum	N/A	1..3	N/A	N
52	Tab coast out-of-range tracks	tab_or	Enum	N/A	0.2.3	N/A	N
53	Display number for VFR list	vfr_dsp_nbr	Int	N/A	1..MAX_NUMDQ	N/A	N
54	VFR fp stat	vfr_fp_stat	Enum	N/A	0..3	N/A	N
55	Unused	unused1	Enum	N/A	0..8	N/A	N
56	Global leader dir ind F7 L dd	global_ldr	Enum	N/A	0..6	N/A	N
57	ARTS to ARTS symbol	atoa_sym	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
58	4 Aircraft type characters	ac_type[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
59	4 Aircraft type characters	ac_type[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
60	Track assigned altitude	alt_asg[[4]=1]	ASCII	ft	NULL 001..999	100 ft	N
61	Track assigned altitude	alt_asg[[4]= 4]	ASCII	ft	NULL 001..999	100 ft	N
62	Airport and SS entry fixes	entry_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
63	Airport and SS entry fixes	entry_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
64	Airport and SS exit fixes	exit_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
65	Airport and SS exit fixes	exit_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
66	Exit Fix characters	exitfix_char[[MAX_AREA_LEVELS]=1]	ASCII	N/A	'A'-'Z'	N/A	N
67	Exit Fix characters	exitfix_char[[MAX_AREA_LEVELS]= 10]	ASCII	N/A	'A'-'Z'	N/A	N
68	Symbol and Subset of ART-ART UHO	art2art_uho[2]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
69	8 Aircraft ID characters	fid[[8]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
70	8 Aircraft ID characters	fid[[8]= 8]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
71	Fix Pair Scratch Pad	fixpair_scratpad[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
72	Fix Pair Scratch Pad	fixpair_scratpad[	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N

		[3]= 3]					
73	ECID (ddA)	if_ecid[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
74	ECID (ddA)	if_ecid[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
75	TCID of other ARTS site	if_tcid[[3]=1]	ASCII	N/A	'0'-'9'	N/A	N
76	TCID of other ARTS site	if_tcid[[3]= 3]	ASCII	N/A	'0'-'9'	N/A	N
77	Keyboard symbol	kybdsymb	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
78	Unused	unused2	ASCII	N/A	N/A	N/A	N
79	Remark for Rundown List	rund_remark[4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
80	Satellite airport symbol	sat_apt	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
81	Scratch Pad 1 Characters	scratch_pad[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
82	Scratch Pad 1 Characters	scratch_pad[[3]=3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
83	Scratch Pad 2 Characters	scratch_pad2[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
84	Scratch Pad 2 Characters	scratch_pad2[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
85	Site adapted alpha character	sitechar	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
86	Tabular line identifier	tablinid	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	Y
87	VFR FP Tab Line Identifier	vfrfp_linid	ASCII	N/A	'0'-'9' space	N/A	N
88	Auto-acquire flag	aa	Boolean	N/A	0..1	N/A	N
89	Assigned Altitude flag	asng_alt	Boolean	N/A	0..1	N/A	N
90	CA alert display indicator	disp_ca	Boolean	N/A	0..1	N/A	N
91	MSAW Climb indicator	disp_climb	Boolean	N/A	0..1	N/A	N
92	Display DB indicator	disp_db	Boolean	N/A	0..1	N/A	N
93	Display DM indicator	disp_dm	Boolean	N/A	0..1	N/A	N
94	Display/retain FDB indicator	disp_fdb	Boolean	N/A	0..1	N/A	N
95	Display blinking FP indicator	disp_fp	Boolean	N/A	0..1	N/A	N
96	Display blinking IF indicator	disp_if	Boolean	N/A	0..1	N/A	N
97	MSAW warning indictor	disp_la	Boolean	N/A	0..1	N/A	N
98	Display interfacility NAT ind	disp_nat	Boolean	N/A	0..1	N/A	N
99	Display OLD indicator	disp_old	Boolean	N/A	0..1	N/A	N
100	Display Pointout indicator	disp_po	Boolean	N/A	0..1	N/A	N
101	Emer/radio fail/hijack indicator	em	Boolean	N/A	0..1	N/A	N
102	Exit Fix is Primary Airport ind	exitfix_is_pri_apt	Boolean	N/A	0..1	N/A	N
103	Flashing ABC indicator	flash_abc	Boolean	N/A	0..1	N/A	N
104	Forced control change	force_ctl_chg	Boolean	N/A	0..1	N/A	N
105	Freeze full data block indicator	frz_fdb	Boolean	N/A	0..1	N/A	N
106	Heavy aircraft indicator	heavy	Boolean	N/A	0..1	N/A	N
107	Interfacility handoff complete	ho_comp	Boolean	N/A	0..1	N/A	N
108	Inhibit auto acquisition	iaa	Boolean	N/A	0..1	N/A	N
109	Interfacility late hand-off ind	iaf_lho	Boolean	N/A	0..1	N/A	N
110	IF ARSA Indicator	if_arsa	Boolean	N/A	0..1	N/A	N
111	IF AHO inhibited (delta) flag	if_delta	Boolean	N/A	0..1	N/A	N
112	IF late handoff indicator	if_lho	Boolean	N/A	0..1	N/A	N
113	Display intrafacility NAT	intra_nat	Boolean	N/A	0..1	N/A	N

	ind						
114	Leader Direction Change Request	ldr_dir_chg	Boolean	N/A	0..1	N/A	N
115	Out of range indicator	outofrng	Boolean	N/A	0..1	N/A	N
116	Radar only flight plan indicator	rdr_only	Boolean	N/A	0..1	N/A	N
117	Ring remote MSAW alarm	remote_alarm	Boolean	N/A	0..1	N/A	N
118	MSAW alarm indicator	ring_msaw	Boolean	N/A	0..1	N/A	N
119	Satellite List Entry	sat_list_entry	Boolean	N/A	0..1	N/A	N
120	Suspend out-of-range indicator	sdor	Boolean	N/A	0..1	N/A	N
121	Unused	unused3	Boolean	N/A	0..1	N/A	N
122	Track active status	status_a	Boolean	N/A	0..1	N/A	N
123	Suspend trk trk/not trk	susp_trk_not_trk	Boolean	N/A	0..1	N/A	N
124	Suspend track special symbol	sus_trk_sym	Boolean	N/A	0..1	N/A	N
125	TA beacon code received	taval	Boolean	N/A	0..1	N/A	N
126	TI beacon code received	tival	Boolean	N/A	0..1	N/A	N
127	Live/training track indicator	tng	Boolean	N/A	0..1	N/A	N
128	VFR Fix intermediate flag	vfrfp_fixint	Boolean	N/A	0..1	N/A	N
129	VFR fp originated at ARTS	vfr_arts	Boolean	N/A	0..1	N/A	N
130	VFR flight plan	vfr_fp	Boolean	N/A	0..1	N/A	N
131	Old status before auto-status-chg	old_ade_stat	Enum	N/A	0..255	N/A	Y
132	Pad	pad3[2]	Int	N/A	N/A	N/A	N

Table 21.3.5.4.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Flight Plan Maintenance Msg code	Message Code = 1963	uns16	1	31-16
2	Flight Plan Maintenance Msg length	Message Length = 268 bytes	uns16	1	15-0
3	Assigned beacon code		uns16	2	31-16
4	Active controller		uns16	2	15-0
5	Auto-handoff altitude		uns16	3	31-16
6	Track requested altitude		int16	3	15-0
7	Flight Plan assigned altitude		int16	4	31-16
8	ETA/PTD in minutes since midnight		uns16	4	15-0
9	FDF Number		uns16	5	31-16
10	Directed Handoff controller		uns16	5	15-0
11	IF message number		uns16	6	31-16
12	IF message time delta	(seconds)	uns16	6	15-0
13	Scratchpad 2 countdown time	(seconds)	uns16	7	31-16
14	IF TU time delta	(seconds)	uns16	7	15-0
15	Old IF Controller		uns16	8	31-16
16	Old Primary Controller		uns16	8	15-0
17	Primary controller		uns16	9	31-16
18	Pad1		uns16	9	15-0
19	TCID		uns16	10	31-16
20	TI/TA beacon code		uns16	10	15-0
21	Track number (per sensor)	1	uns16	11	31-16
22	Track number (per sensor)	15	uns16	18	31-16
23	Redirect Controller		uns16	18	15-0
24	Sensor link/no link indicator	These [Fields = 3] are repeated [[MAX_SENSQ] =1] times	boolean	19	31-24
25	Sensor real/pseudo link indicator		boolean	19	23-16
26	Pad2[2]		uns8	19	15-0
27	Sensor link/no link indicator	These [Fields = 3] are repeated [[MAX_SENSQ] = 15] times	boolean	33	31-24
28	Sensor real/pseudo link indicator		boolean	33	23-16
29	Pad2[2]		uns8	33	15-0
30	Assigned beacon code status	ABC_EXISTS(0)=assigned TENT_ABC(1)=tentative assigned NO_ABC(2)=no assigned	uns8	34	31-24
31	ACID number of non-space chars		uns8	34	23-16
32	Aircraft category		uns8	34	15-8
33	Original Aircraft category		uns8	34	7-0
34	Arrival/Departure/Enroute status	Must be ADE_OVERFLIGHT or ADE_ARR_UNKNOWN..ADE_ARRU or ADE_DEP_UNKNOWN..ADEPU	uns8	35	31-24
35	Auto-handoff index		int8	35	23-16
36	Adjacent ARTS ID		uns8	35	15-8
37	Aircraft type disp counter		uns8	35	7-0

38	Flight plan adaptor number		uns8	36	31-24
39	FP status controlled VFR flight	0 = IFR1 = VFR2 = VFR_ON_TOP	uns8	36	23-16
40	Handoff Countdown		uns8	36	15-8
41	Handoff status	0=not in handoff 1=intrafacility countdown 2=interfacility countdown 3=intrafacility 4=to ARTCC 5=from ARTCC	uns8	36	7-0
42	Count of DX messages received		uns8	37	31-24
43	Count of attempts to send a msg		uns8	37	23-16
44	ARTCC sector handing off to		uns8	37	15-8
45	ARTCC site messages are sent to		uns8	37	7-0
46	IF message status	See text	uns8	38	31-24
47	Keyboard subset		uns8	38	23-16
48	Leader direction from change req	LDR_N(0)=North LDR_NE(1)=Northeast LDR_E(2)=EastLDR_SE(3)=Southeast LDR_S(4)=South LDR_SW(5)=Southwest LDR_W(6)=WestLDR_NW(7)=Northwest	uns8	38	15-8
49	Active radar subsystem		uns8	38	7-0
50	Track type	0=store 1=tab coast 2=suspend not tracking 3=suspend	uns8	39	31-24
51	Track usage status	ASSOCIATED(1)=associated UNASSOCIATED(3)=unassociated	uns8	39	23-16
52	Tab coast out-of-range tracks	0=not OR 2=OR 3=blinking OR	uns8	39	15-8
53	Display number for VFR list		uns8	39	7-0
54	VFR fp stat	0=VFR 1=FIX 2=IFP	uns8	40	31-24
55	Unused1		uns8	40	23-16
56	Global leader dir ind F7 L dd	C_NONGLOBAL=0, C_SPECIAL_OFFSET_AREA_GLOBAL=1, C_KEYBOARD_SPECIFIED_GLOBAL=2, GLOBAL_KYBD_ENT=4	enum	40	15-8
57	ARTS to ARTS symbol		char	40	7-0
58	4 Aircraft type characters	(1)	char	41	31-24
59	4 Aircraft type characters	(4)	char	41	7-0
60	Track assigned altitude	(1)	char	42	31-24
61	Track assigned altitude	(4)	char	42	7-0
62	Airport and SS entry fixes	(1)	char	43	31-24
63	Airport and SS entry fixes	(4)	char	43	7-0
64	Airport and SS exit fixes	(1)	char	44	31-24
65	Airport and SS exit fixes	(4)	char	44	7-0
66	Exit Fix characters	(1)	char	45	31-24
67	Exit Fix characters	(10)	char	47	23-16
68	Symbol and Subset of ART-ART UHO	(1)	char	47	15-8
69	Symbol and Subset of ART-ART UHO	(2)	char	47	7-0

70	8 Aircraft ID characters	(1)	char	48	31-24
71	8 Aircraft ID characters	(8)	char	49	7-0
72	Fix Pair Scratch Pad	(1)	char	50	31-24
73	Fix Pair Scratch Pad	(3)	char	50	15-8
74	ECID (ddA)	(1)	char	50	7-0
75	ECID (ddA)	(3)	char	51	23-16
76	TCID of other ARTS site	(1)	char	51	15-8
77	TCID of other ARTS site	(3)	char	52	31-24
78	Keyboard symbol		char	52	23-16
79	Unused2		char	52	15-8
80	Remark for Rundown List	(1)	char	52	7-0
81	Remark for Rundown List	(4)	char	53	15-8
82	Satellite airport symbol		char	53	7-0
83	Scratch Pad 1 Characters	(1)	char	54	31-24
84	Scratch Pad 1 Characters	(3)	char	54	15-8
85	Scratch Pad 2 Characters	(1)	char	54	7-0
86	Scratch Pad 2 Characters	(3)	char	55	23-16
87	Site adapted alpha character		char	55	15-8
88	Tabular line identifier		char	55	7-0
89	VFR FP Tab Line Identifier		char	56	31-24
90	Auto-acquire flag		boolean	56	23-16
91	Assigned Altitude flag		boolean	56	15-8
92	CA alert display indicator		boolean	56	7-0
93	MSAW Climb indicator		boolean	57	31-24
94	Display DB indicator		boolean	57	23-16
95	Display DM indicator		boolean	57	15-8
96	Display/retain FDB indicator		boolean	57	7-0
97	Display blinking FP indicator		boolean	58	31-24
98	Display blinking IF indicator		boolean	58	23-16
99	MSAW warning indictor		boolean	58	15-8
100	Display interfacility NAT ind		boolean	58	7-0
101	Display OLD indicator		boolean	59	31-24
102	Display Pointout indicator		boolean	59	23-16
103	Emer/radio fail/hijack indicator		boolean	59	15-8
104	Exit Fix is Primary Airport ind		boolean	59	7-0
105	Flashing ABC indicator		boolean	60	31-24
106	Forced control change		boolean	60	23-16
107	Freeze full data block indicator		boolean	60	15-8
108	Heavy aircraft indicator		boolean	60	7-0
109	Interfacility handoff complete		boolean	61	31-24
110	Inhibit auto acquisition		boolean	61	23-16
111	Interfacility late hand-off ind		boolean	61	15-8
112	IF ARSA Indicator		boolean	61	7-0
113	IF AHO inhibited (delta) flag		boolean	62	31-24

114	IF late handoff indicator		boolean	62	23-16
115	Display intrafacility NAT ind		boolean	62	15-8
116	Leader Direction Change Request		boolean	62	7-0
117	Out of range indicator		boolean	63	31-24
118	Radar only flight plan indicator		boolean	63	23-16
119	Ring remote MSAW alarm		boolean	63	15-8
120	MSAW alarm indicator		boolean	63	7-0
121	Rundown List change not yet ack		boolean	64	31-24
122	Satellite List Entry		boolean	64	23-16
123	Suspend out-of-range indicator		boolean	64	15-8
124	Unused3		boolean	64	7-0
125	Track active status		boolean	65	31-24
126	Suspend trk trk/not trk		boolean	65	23-16
127	Suspend track special symbol		boolean	65	15-8
128	TA beacon code received		boolean	65	7-0
129	TI beacon code received		boolean	66	31-24
130	Live/training track indicator		boolean	66	23-16
131	VFR Fix intermediate flag		boolean	66	15-8
132	VFR fp originated at ARTS		boolean	66	7-0
133	VFR flight plan		boolean	67	31-24
134	Old status before auto-status-chg		uns8	67	23-16
135	Pad3	(1)	uns8	67	15-8
136	Pad3	(2)	uns8	67	7-0

21.3.5.5 ARMT Heartbeat Msg (m_armt_fast_hbeat)

External form of the AGW Heartbeat Msg (1301). This submessage is sent by the ARMT CSCI once per second. It contains the ARMT process state and the current system time. The ARMT State contains one of the following values:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

Table 21.3.5.5.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	Current System Time within day	system_time	Int	msec	0..86399999	1	Y
4	Day of Year	day_of_year	Int	N/A	1..366	N/A	Y
5	Four digits - year	year	Int	N/A	1970..2037	N/A	Y
6	FAST State (see text)	fast_state	Enum	N/A	0..3	N/A	N
7	Pad msg to multiple of 32 bits	pad[3]	char	N/A	N/A	N/A	N

Table 21.3.5.5.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1394	uns16	1	31-16
2	Submessage length	Message Length = 16 bytes	uns16	1	15-0
3	Current System Time within day		uns32	2	31-0
4	Day of Year		uns16	3	31-16
5	Four digits - year		uns16	3	15-0
6	CTIS State (see text)		uns8	4	31-24
7	Pad msg to multiple of 32 bits		uns8	4	23-0

21.3.5.6 ARMT PC Heartbeat Msg (m_armt_hbeat)

This submessage is sent to the AGW once per second by the ARMT PC. The CTIS CSCI will process this message to determine the presence of the ARMT PC and the condition of the interconnecting network link.

The ARMT State field contains one of the following values representing the state of the ARMT PC:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

Table 21.3.5.6.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	ARMT State (see text)	armt_state	Enum	N/A	0..3	N/A	N
4	Pad msg to multiple of 32 bits	pad[3]	char	N/A	N/A	N/A	N

Table 21.3.5.6.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1395	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	ARMT State (see text)		uns8	2	31-24
4	Pad msg to multiple of 32 bits		uns8	2	23-0

21.3.5.7 ARMT CDR Autofunction Msg for ARMT (m_armt_cdr_auto)

This message is sent to ARMT to transfer the automatic function information to the ARMT PC. This message is sent by the CP each time an automatic function occurrence is generated. This is the external form of message (msg1802). It is sent on each occurrence in the CP of an automatic function to the ARMT PC.

Following are the automatic functions:

AUTOF_TERMINATE	1	Terminate
AUTOF_ACQUIRE	2	Acquire
AUTOF_TABULAR_COAST	3	Tabular Coast
AUTOF_HANDOFF_COAST	4	Handoff Coast
AUTOF_SUSPEND_COAST	5	Suspend Coast
AUTOF_INITIATE	6	Initiate
AUTOF_GHOST_INITIATE	7	Ghost Initiate
AUTOF_GHOST_DROP	8	Ghost Drop
AUTOF_AUTO_HANDOF	9	Auto Handoff
AUTOF_ASG_BC	10	Assign Beacon
AUTOF_BLIND_COAST	11	Blind Zone Coast
AUTOF_SUSPEND	12	Suspend
AUTOF_DISASSOC	13	Disassociate
AUTOF_DASI	14	Function DASI Altimeter

For the ghost track drop function, following are the types:

C_GDF_NORMAL	0	Normal
C_GDF_BCN	1	Beacon code does not match adapt
C_GDF_RWY_SCORE	2	Runway score
C_GDF_HEADING	3	Heading not in tolerance
C_GDF_IN_OUT	4	Track fails inner/outer boundary
C_GDF_SIDE	5	Track fails left/right boundary
C_GDF_AMBIQUITY	6	Unresolvable ambiquity

For the Special Offset Auto Leader Modify, the leader directions are:

LDR_N	0	North
LDR_NE	1	Northeast
LDR_E	2	East
LDR_SE	3	Southeast
LDR_S	4	South
LDR_SW	5	Southwest
LDR_W	6	West
LDR_NW	7	Northwest
LDR_NONE	8	None

Table 21.3.5.7.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
	Fields 3 thru 22 are repeated multiple times as needed or						

	zero filled to end of message						
3	Zulu Time	time	Int	Seconds	0..86399	1	N
4	Assigned Beacon Code	abc	Int	N/A	0000..7777	N/A	N
5	Displayed Y Coordinate	dsp_y_coord	Int	NM	-64..64	1/16	N
6	Displayed X Coordinate	dsp_x_coord	Int	NM	-64..64	1/16	N
7	Current Altimeter Setting	altimeter	Int	Inches	27..32	1/512	N
8	Altimeter Region ID	altimeter_region[MSG1398_ALTIMETER_REGION_LENGTH]	Char	N/A	'A'..'Z' or '0'..'9'	N/A	N
9	Raw Altimeter Characters	raw_altim_chars[MSG1398_RAW_ALTIM_CHARS]	Char	N/A	'A'..'Z' or '0'..'9'	N/A	N
10	Ghost Drop Code	gd_type	Enum	N/A	0..6	N/A	N
11	Autofunction Number (see above text)	auto_type	Enum	N/A	0..14	N/A	N
12	ETG Indicator	etg	Boolean	N/A	0..1	N/A	N
13	Associated Track Indicator	at	Int	N/A	0..1	N/A	N
14	Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	N
15	Aircraft ID	acid[MSG1398_ACID_LENGTH]	Char	N/A	'A'..'Z' or '0'..'9'	N/A	N
16	Keyboard Subset	kybdset	Int	N/A	1..7	N/A	N
17	ABC Status	abc_status	Enum	N/A	0..2	N/A	N
18	Controller Symbol	cont_symbol	Char	N/A	'A'..'Z' or '0'..'9'	N/A	N
19	Intra AHI/AHA Receiving Controller Subset	rec_kybdset	Int	N/A	1..7	N/A	N
20	Intra AHI/AHA Receiving Controller Symbol	rec_cont_symbol	Char	N/A	'A'..'Z' or '0'..'9'	N/A	N
21	Special Offset Leader Direction	sp_offset_leader	Enum	N/A	0..8	N/A	N
22	Byte Pad	unused1[2]	Int	N/A	N/A	N/A	N

Table 21.3.5.7.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1398	uns16	1	31-16
2	Submessage length	Message Length = 1444 bytes	uns16	1	15-0
	Fields 3 thru 22 are repeated multiple times as needed or zero filled to end of message				
3	Zulu Time		uns32	2	31-0
4	Assigned Beacon Code		uns16	3	31-16
5	Displayed Y Coordinate		int16	3	15-0
6	Displayed X Coordinate		int16	4	31-16
7	Current Altimeter Setting		uns16	4	15-0
8	Altimeter Region ID	4 ASCII Characters[1]	char	5	31-24
8	Altimeter Region ID	4 ASCII Characters[4]	char	5	7-0
9	Raw Altimeter Characters	4 ASCII Characters[1]	char	6	31-24
9	Raw Altimeter Characters	4 ASCII Characters[4]	char	6	7-0
10	Ghost Drop Code		uns8	7	31-24
11	Autofunction Number (see above text)		uns8	7	23-16
12	ETG Indicator		boolean	7	15-8

13	Associated Track Indicator		uns8	7	7-0
14	Sensor Number		uns8	8	31-24
15	Aircraft ID	7 ASCII Characters[1]	char	8	23-16
15	Aircraft ID	7 ASCII Characters[7]	char	9	7-0
16	Keyboard Subset		uns8	10	31-24
17	ABC Status		uns8	10	23-16
18	Controller Symbol		uns8	10	15-8
19	Intra AHI/AHA Receiving Controller Subset		uns8	10	7-0
20	Intra AHI/AHA Receiving Controller Symbol		uns8	11	31-24
21	Special Offset Leader Direction		uns8	11	23-16
22	Byte Pad	[1]	uns8	11	15-8
22	Byte Pad	[2]	uns8	11	7-0

Section 22
PRECISION RUNWAY MONITOR INTERFACE

22.1 GENERAL DESCRIPTION

The Precision Runway Monitor Interface provides tracking and flight plan information to external data collection and analysis tools. Common ARTS provides this interface through a generic firewall capability through the use of an ARTS Interface Gateway Chassis (AGW). The AGW runs various processes to interface and convert messages between Common ARTS and other equipment and acts to isolate the external equipment from the operational local area networks. An implementation of the Common Terminal Interface Software (CTIS) is used to convert the current Common ARTS messages to an external form used by the Precision Runway Monitor system.

22.2 REFERENCED DOCUMENTS

22.2.1 Applicable Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered a superseding requirement.

22.2.1.1 Applicable Government Documents

Specifications

ATC 60050	Common ARTS Interface Design Document

Standards

None.

Other Publications

None.

22.2.1.2 Applicable Non-Government Documents

Specifications

None.

Standards

FIPS PUB 160	American National Standard for Information Systems - Programming Language – C
ANSI/IEEE Standard 802.3 -	Institute of Electrical and Electronic Engineers-Local Area Networks International Standards Organization (ISO) Open System Interconnect (OSI) Reference Mode and ISO Communication Protocol Standards.
IETF STD-0005	Internet Protocol, September 1981
IETF STD-0007	Transmission Control Protocol, September 1981

IETF STD-0041	Standard for the transmission of IP datagrams over Ethernet networks, April 1984

Other Publications

None.

22.2.2 Compliance Documents

The following documents of the exact issue shown form a part of this document to the extent described herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of the referenced document shall be considered a superseding requirement.

FAA Contracts and Contract Sections

FAA Specifications

FAA-E-2759	ARTS IIIE System Functional Specification, 13 August 1993.

FAA Computer Program Functional Specifications

ARTS NAS-MD-634, A6.05/A2.09	System Description and Specified Series, Final, Rev. A, November 1997
ARTS NAS-MD-638, A6.05/A2.09	Keyboard, Final, Rev. A, November 1997
ARTS NAS-MD-639, A6.05/A2.09	Display Output Processing and Converging Runway Display Aid (CRDA), Final, Rev. A, November 1997
ARTS NAS-MD-642, A6.05/A2.09	Error and Status Messages, Final, Rev. A, November 1997
ARTS NAS-MD-643, A6.05/A2.09	Site Adaptation, Final, Rev. A, November 1997
ARTS NAS-MD-646, A6.05/A2.09	CDR Editor, RETRACK and Disk/File Utilities, Final, Rev. A, November 1997
ARTS NAS-MD-648, A6.05/A2.09	Continuous Data Recording Processing and Performance Monitoring, Final, Rev. A, November 1997

FAA Standards

None.

Military Specifications and Standards

None.

Other Publications

None.

22.3 PRECISION RUNWAY MONITOR INTERFACE

22.3.1 General Information

The Common ARTS Interface to the Precision Runway Monitor Data Collection PC is through a 100 megabit per second ethernet running TCP/IP protocols. The ethernet interface in the AGW is used to communicate to the ethernet port on the PRM PC. The AGW hardware in the IIIE system is made up of two VME Chassis's connected to two independent Cisco firewalls which are then connected to a hub. The AGW hardware in the IIE system is made up of a single PC connected directly to a hub.

22.3.2 Mechanical Characteristics

The ethernet connection on either the IIIE or IIE versions of the AGW are made of a RJ45 architecture. All the external systems that wish to interface to the Common ARTS system will use a RJ45 cable over a 10/100 Mbit connection to attach their computer to the same hub as that of the AGW.

22.3.3 Electrical Characteristics

The RJ45 interface that connects to the hub conforms to the industry standard layout defined for this interface. A 100 Mbit RJ45 connection is highly recommended to minimize 10Mbit bottlenecks on the network.

The PowerPC version of the AGW is a RJ45 10/100 connection into a CISCO Firewall/Router or directly into the AGW depending on site adaptation. Normal configuration is a RJ45(Cat. 5) connection into a Switch in route to a CISCO Firewall/Router(connected to the AGW), which conforms to the industry standard RJ45 10/100 Cat 5 configuration for this interface.

The Linux i86 version of the AGW is a RJ45 10/100 connection directly into the AGW or a 10/100 Switch(sites with multiple AGW clients) which conforms to the industry standard layout for this interface.

22.3.4 Network Protocol

The Precision Runway Monitor interface to the Common ARTS system uses TCP/IP protocols. The Common Terminal Interface Software (CTIS) process running in the AGW acts as a TCP server. In order to provide redundant paths to the PRM system two processes are utilized (prm-1 and prm-2), they are designed to communicate on ports **5070** and **5071** respectively. All data is passed in network byte order (big endian). The IP address for this interface is set in Common ARTS Adaptation and is physically set by CTIS when the program initializes.

Messages are passed to and from the Common ARTS AGW using a simple higher level protocol running on top of the TCP/IP. Each message consists of a 2 byte code field and 2 byte length field followed by one or more submessages. The length specifies the total length of all of the submessages including the 4 bytes for code and length that make up this message.

22.3.5 Data Format

The submessages each have a 2 byte submessage code and a 2 byte length followed by data specific to the submessage. The submessage length does include the length of the code and length fields thus no submessage can be less than 4 bytes long and likewise no message can be less than 4 bytes long.

Submessages from AGW to Precision Runway Monitor PC

Submessage	Code
PRM Active Track Maintenance Msg	0x1380
PRM Delete Flight Data Msg	0x1381
PRM Delete Track Msg	0x1382
PRM Flight Plan Maintenance Msg	0x1383
PRM Heartbeat Msg	0x1384
PRM Adaptation Msg	0x1386
PRM CA Conflict Pairs Msg	0x1389

Submessages from PC to AGW

Submessage	Code
PRM PC Heartbeat Msg	0x1385

The detail structure of the submessages are described in the following sections. Typically, these structures are defined as C data structures that are included with the application program that processes the messages.

22.3.5.1 PRM Active Track Maintenance Msg (m_prm_atm)

External form of Active Track Maintenance Msg (1700). The Active Track Maintenance (ATM) message is sent from various CSCIs to indicate to the receiving CSCIs that track data has been updated. It contains the updated track position, speed, altitude, etc. The ATM message is most commonly sent by TPS and received by CPS (for linking and FP association), DPS (for display), and SMON (for recording). It is sent once per track per scan via the Track Sensor Multiqueue.

ATMs come in two categories: "principal" and "subordinate". Principal ATMs are sent in the normal case (as described above) for all tracks in all sensors, including ARSRs. Subordinate ATM messages are used in the special case when a Display Sensor Switch command is entered and an ARSR is selected to backup a given ASR. When this condition is present, TPS adds data to the message to provide transformed XY coordinates (relative to the specific ASR) and sends the ATM again via another multiqueue. This additional multiqueue is named appropriately to define the specific ARSR-ASR combination. The sub_sensor field distinguishes Principal ATMs from Subordinate ATMs: IF sub_sensor == NULL_SENSOR, THEN this is a Principal ATM. The fields sub_rept_pos_x, sub_rept_pos_y, and sub_rep_range only have meaning in Subordinate ATMs.

Table 22.3.5.1.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUMMSGL	1	Y
3	Predicted Altitude - Uncorrected	pre_alt	Scaled	Feet	-1000..99900	1/8	N
4	Reported Altitude - Corrected	rep_alt	Scaled	Feet	-1000..99900	1/8	N
5	Smoothed Altitude - Uncorrected	smooth_alt	Scaled	Feet	-1000..99900	1/8	N
6	Time of Last Correlation (zulu msecs)	last_coorel	Int	msec	0..86399999	1	N
7	Altitude Correction Factor	alt_correction	Int	Feet	-1900..2900	1/8	N
8	Altitude Velocity	alt_veloc	Int	Feet/Sec	-1000..1000	1/8	N
9	Track Reported X Coord	rept_pos_x	Scaled	NM	-256..256	1/128	N
10	Track Reported Y Coord	rept_pos_y	Scaled	NM	-256..256	1/128	N
11	Subordinate Track Reported X Coord	sub_rept_pos_x	Scaled	NM	-256..256	1/128	N
12	Subordinate Track Reported Y Coord	sub_rept_pos_y	Scaled	NM	-256..256	1/128	N
13	X Velocity	xdot	Scaled	NM/Sec	-0.25..0.25	1/65536	N
14	Y Velocity	ydot	Scaled	NM/Sec	-0.25..0.25	1/65536	N
15	Altitude Acceleration	alt_accel	Scaled	Ft/Sec/Sec	-160..160	1/8	N
16	Track Predicted Azimuth	azimuth	Scaled	ACP	0..4096	1/16	N
17	Track Predicted Range	range	Scaled	NM	0..256	1/256	N
18	Reported Beacon Code	rbc	Int	N/A	0..07777	1	N
19	Last Valid Reported Azimuth	rep_azimuth	Scaled	ACP	0..4096	1/16	N
20	Last Valid Reported Range	rep_range	Scaled	NM	0..256	1/256	N
21	Subordinate Reported Range	sub_rep_range	Scaled	NM	0..256	1/256	N
22	Track Reported System X Coord	rept_sys_x	Scaled	NM	0..1024	1/64	N
23	Track Reported System Y	rept_sys_y	Scaled	NM	0..1024	1/64	N

	Coord						
24	Track Speed	speed	Scaled	NM/sec	0..0.25	1/65536	N
25	Track Number	trk_num	Int	N/A	1..TQi	1	Y
26	Pseudo Track	pseudo_trk	Boolean	N/A	0..1	N/A	N
27	Altitude Firmness	alt_firm	Int	N/A	0..17	N/A	N
28	Altitude History	alt_sld_window	Encoded	N/A	0..0377	N/A	N
29	Track Firmness Value	firmness	Int	N/A	0..39	N/A	N
30	Principal Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
31	Track Usage Status	status_ut	Enum	N/A	N/A	N/A	N
32	Subordinate Sensor Number	sub_sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
33	Track Class	tr_class	Enum	N/A	N/A	N/A	N
34	Mode 3A (RBC) Validity	va	Enum	N/A	0..3	N/A	N
35	Mode C (altitude) Validity	vc	Enum	N/A	0..3	N/A	N
36	Beacon Correlation	bcn_corl	Boolean	N/A	0..1	N/A	N
37	Deviation Trial Track	deviat	Boolean	N/A	0..1	N/A	N
38	Drop BCID Request	drop_bcid	Boolean	N/A	0..1	N/A	N
39	Emergency Indicator	em	Boolean	N/A	0..1	N/A	N
40	Initial Track Indicator	initial	Boolean	N/A	0..1	N/A	N
41	No Altitude	no_alt	Boolean	N/A	0..1	N/A	N
42	No RBC	no_rbc	Boolean	N/A	0..1	N/A	N
43	Parrot Track Indicator	parrot_trk	Boolean	N/A	0..1	N/A	N
44	Radar Correlation	rdr_corl	Boolean	N/A	0..1	N/A	N
45	Radar Only Track	rdr_only_trk	Boolean	N/A	0..1	N/A	N
46	Special Position Ident	spi	Boolean	N/A	0..1	N/A	N
47	Terminate Requested	term_req	Boolean	N/A	0..1	N/A	N
48	Training Status	tng	Boolean	N/A	0..1	N/A	N
49	Unreasonable Mode C	un_modec	Boolean	N/A	0..1	N/A	N
50	Valid Altitude	valid_alt	Boolean	N/A	0..1	N/A	N

Table 22.3.5.1.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1380	uns16	1	31-16
2	Submessage Length	Message Length = 84 bytes	uns16	1	15-0
3	Predicted Altitude - Uncorrected		int32	2	31-0
4	Reported Altitude - Corrected		int32	3	31-0
5	Smoothed Altitude - Uncorrected		int32	4	31-0
6	Time of Last Correlation (zulu msecs)		uns32	5	31-0
7	Altitude Correction Factor		int16	6	31-16
8	Altitude Velocity		int16	6	15-0
9	Track Reported X Coord		int16	7	31-16
10	Track Reported Y Coord		int16	7	15-0
11	Subordinate Track Reported X Coord		int16	8	31-16
12	Subordinate Track Reported Y Coord		int16	8	15-0
13	X Velocity		int16	9	31-16
14	Y Velocity		int16	9	15-0

15	Altitude Acceleration		int16	10	31-16
16	Track Predicted Azimuth		uns16	10	15-0
17	Track Predicted Range	DPS Checks 0..90.5	uns16	11	31-16
18	Reported Beacon Code		uns16	11	15-0
19	Last Valid Reported Azimuth		uns16	12	31-16
20	Last Valid Reported Range		uns16	12	15-0
21	Subordinate Reported Range		uns16	13	31-16
22	Track Reported System X Coord		uns16	13	15-0
23	Track Reported System Y Coord		uns16	14	31-16
24	Track Speed		uns16	14	15-0
25	Track Number		uns16	15	31-16
26	Pseudo Track		uns16	15	15-0
27	Altitude Firmness		uns8	16	31-24
28	Altitude History		uns8	16	23-16
29	Track Firmness Value		uns8	16	15-8
30	Principal Sensor Number		uns8	16	7-0
31	Track Usage Status	ASSOCIATED(1)=associated UNASSOCIATED(3)=unassociated	uns8	17	31-24
32	Subordinate Sensor Number		uns8	17	23-16
33	Track Class	NORMAL_TRACK(0)=Normal PARENT_TRACK(1)=Parent TRIAL_TRACK(2)=Parent Trial TENTATIVE_TRACK(3)=Tentative	uns8	17	15-8
34	Mode 3A (RBC) Validity	NOTVALID(0)=Invalid GARBLED(1)=Garbled VALID_MODE3A(2)=Report Mode 3A Check VALID(3)=Valid	uns8	17	7-0
35	Mode C (altitude) Validity	NOTVALID(0)=Invalid GARBLED(1)=Garbled VALID_MODEC(2)=Reported Mode C Check VALID(3)=Valid	uns8	18	31-24
36	Beacon Correlation		boolean	18	23-16
37	Deviation Trial Track		boolean	18	15-8
38	Drop BCID Request		boolean	18	7-0
39	Emergency Indicator		boolean	19	31-24
40	Initial Track Indicator		boolean	19	23-16
41	No Altitude		boolean	19	15-8
42	No RBC		boolean	19	7-0
43	Parrot Track Indicator		boolean	20	31-24
44	Radar Correlation		boolean	20	23-16
45	Radar Only Track		boolean	20	15-8
46	Special Position Ident		boolean	20	7-0
47	Terminate Requested		boolean	21	31-24
48	Training Status		boolean	21	23-16
49	Unreasonable Mode C		boolean	21	15-8
50	Valid Altitude		boolean	21	7-0

22.3.5.2 PRM Delete Flight Data Msg (m_prm_d_fp)

External form of the Delete Flight Data Msg (1809). This submessage is sent whenever the CP sets an FDF record to unused. It is used to inform the DP to set the corresponding FDF record to unused status.

Table 22.3.5.2.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
3	Record number in CP FDF	fp_nbr	Int	N/A	1..MAX_FDFQ	1	Y
4	Sensor number	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	1	N
5	Live/training track indicator	training	Boolean	N/A	0..1	N/A	N

Table 22.3.5.2.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1381	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	Record number in CP FDF		uns16	2	31-16
4	Sensor number		uns8	2	15-8
5	Live/training track indicator		boolean	2	7-0

22.3.5.3 PRM Delete Track Msg (m_prm_dtm)

External form of the Delete Track Msg (1704). This message is sent whenever the TPS sets a track slot to unused. The Delete Track Msg is used to inform the DP and CP to set the corresponding track slot to unused status. This submessage is recorded by CDR when either the TA or TU extraction class is enabled.

Table 22.3.5.3.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage Code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage Length	lgth	Int	bytes	4..MAXSUBMSGL	1	Y
3	Track Number	trk_num	Int	N/A	1..TQi	1	Y
4	Sensor Number	sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y
5	Subordinate Sensor Number	sub_sensor	Int	N/A	0..MAX_SENSQ-1	N/A	Y

Table 22.3.5.3.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage Code	Message Code = 1382	uns16	1	31-16
2	Submessage Length	Message Length = 8 bytes	uns16	1	15-0

3	Track Number		uns16	2	31-16
4	Sensor Number		uns8	2	15-8
5	Subordinate Sensor Number		uns8	2	7-0

22.3.5.4 PRM Flight Plan Maintenance Msg (m_prm_afpm)

External Form of the Flight Plan Maintenance Msg (1800). This submessage is sent for each active associated track. It contains the current flight plan information. This submessage is transmitted every two minutes or whenever any field in the 1800 message is altered. This submessage is recorded by CDR when the TA extraction class is enabled.

The Interfacility Message Types for a flight plan are as follows:

CF_NOSTATUS	0	No Interfacility Status
CF_DA	1	DA
CF_DX	2	DX
CF_DR	3	DR
CF_DT	4	DT
CF_TR	5	TR
CF_TB	6	TB
CF_DM	7	DM
CF_TU	8	TU
CF_TI	9	TI
CF_TA	10	TA
CF_FP	11	FP
CF_AM	12	AM
CF_CX	13	CX
CF_TL	14	TL
CF_TM	15	TM
CF_TN	16	TN
CF_RF	17	RF
CF_TS	18	TS
CF_TP	19	TP
CF_TZ	20	TZ
CF_VFRFP	21	VFR FP
CF_ARSAFP	22	ARSA FP
CF_MIDTU	23	Middle TU

CF_ENDTU 24 End TU

CF_EXPFP 25 Expect FP

CF_EXPTU 26 Expect TU

Table 22.3.5.4.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Flight Plan Maintenance Msg code	code	Int	code	0..xFFFF	N/A	Y
2	Flight Plan Maintenance Msg length	lgth	Int	bytes	MAFPML	1	Y
3	Assigned beacon code	abc	Int	N/A	0..07777	N/A	N
4	Active controller	act_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y
5	Auto-handoff altitude	aho_alt	Int	feet	0..995	100 ft.	N
6	Track requested altitude	alt_req	Int	feet	-99..999	100 ft.	N
7	Flight Plan assigned altitude	asg_alt	Int	feet	0..999	100 ft.	N
8	ETA/PTD in minutes since midnight	eta_ptd	Int	minutes	0..60*24-1	1	N
9	FDF Number	fdf_num	Int	N/A	1..MAX_FDFQ	N/A	N
10	Directed Handoff controller	ho_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
11	IF message number	if_msgno	Int	N/A	1..999	N/A	N
12	IF message time delta	if_msgtime_delta	Int	seconds	0..65535	1	N
13	IF TU time delta	if_tutime_delta	Int	seconds	0..65535	1	N
14	Old Primary Controller	old_pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	N
15	Primary controller	pri_cont	Int	N/A	0..MAX_NUMKQ	N/A	Y
16	Run Down List	rund	Int	N/A	0..MAX_NUMKQ	N/A	N
17	Satellite List Azimuth	sat_list_azimuth	Int	degrees	0..359	1	N
18	Satellite List Range	sat_list_range	Int	NM	0..64	1	N
19	TCID	tcid	Int	N/A	1..999	N/A	N
20	TI/TA beacon code	tita_bcn	Int	N/A	0..07777	N/A	N
21	Track number (per sensor)	track_nbr[[MAX_SENSQ]=1]	Int	N/A	0..TQi	N/A	N
22	Track number (per sensor)	track_nbr[[MAX_SENSQ]= 15]	Int	N/A	0..TQi	N/A	N
23	Sensor link/no link indicator (per sensor)	link[[MAX_SENSQ]=1]	Boolean	N/A	0..1	N/A	N
24	Sensor real/pseudo link indicator (per sensor)	pseudo[[MAX_SENSQ]=1]	Boolean	N/A	0..1	N/A	N
25	Sensor link/no link indicator (per sensor)	link[[MAX_SENSQ]= 15]	Boolean	N/A	0..1	N/A	N
26	Sensor real/pseudo link indicator (per sensor)	pseudo[[MAX_SENSQ]= 15]	Boolean	N/A	0..1	N/A	N
27	Assigned beacon code status	abc_stat	Enum	N/A	0..2	N/A	N
28	ACID number of non-space chars	acid_non_space	Int	N/A	2..7	N/A	N
29	Aircraft category	ac_cat	ASCII	N/A	H/T/B/F/L	N/A	N
30	Original Aircraft category	orig_ac_cat	ASCII	N/A	H/T/B/F/L/V/U/W	N/A	N
31	Arrival/Departure/Enroute	ade_stat	Enum	N/A	0..255	N/A	Y

	status						
32	Auto-handoff index	aho_ind	Int	N/A	-1..127	N/A	N
33	Adjacent ARTS ID	arts_id	Int	N/A	0..MAX_NO_FACIL	N/A	N
34	Aircraft type disp counter	atcc	Int	scans	0..7	1	N
35	Flight plan adaptor number	fpa	Int	N/A	0..3	1	N
36	FP status controlled VFR flight	fpstatus	Enum	N/A	0..2	N/A	Y
37	Handoff Countdown	ho_cntdn	Int	N/A	0..63	N/A	N
38	Handoff status	ho_stat	Enum	N/A	0..IF_HO_2_ARTCC	N/A	Y
39	Count of DX messages received	if_dx	Int	N/A	0..IF_ITRQ	N/A	N
40	Count of attempts to send a msg	if_msgcount	Int	N/A	0..IF_MAX_RETRY	N/A	N
41	ARTCC sector handing off to	if_sector	INt	N/A	0..31	N/A	N
42	ARTCC site messages are sent to	if_site	Int	N/A	0..3	N/A	N
43	IF message status	if_stat	Enum	N/A	0..24	N/A	N
44	Keyboard subset	kbd_subset	Int	N/A	1..7	N/A	N
45	Leader direction from change req	ldr_dir	Enum	N/A	0..7	N/A	N
46	Active radar subsystem	sensor_nbr	Int	N/A	0..MAX_SENSQ-1	N/A	N
47	Track type	status_tp	Enum	N/A	0..3	N/A	N
48	Track usage status	status_ut	Enum	N/A	1..3	N/A	N
49	Tab coast out-of-range tracks	tab_or	Enum	N/A	0.2.3	N/A	N
50	Display number for VFR list	vfr_dsp_nbr	Int	N/A	1..MAX_NUMDQ	N/A	N
51	VFR fp stat	vfr_fp_stat	Enum	N/A	0..3	N/A	N
52	4 Aircraft type characters	ac_type[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
53	4 Aircraft type characters	ac_type[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
54	Track assigned altitude	alt_asg[[4]=1]	ASCII	ft	NULL 001..999	100 ft	N
55	Track assigned altitude	alt_asg[[4]= 4]	ASCII	ft	NULL 001..999	100 ft	N
56	Symbol and Subset of ART-ART UHO	art2art_uho[[2]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
57	Symbol and Subset of ART-ART UHO	art2art_uho[[2]=2]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
58	ARTS to ARTS symbol	atoa_sym	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
59	Airport and SS entry fixes	entry_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
60	Airport and SS entry fixes	entry_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
61	Airport and SS exit fixes	exit_fix[[4]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
62	Airport and SS exit fixes	exit_fix[[4]= 4]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
63	8 Aircraft ID characters	fid[[8]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
64	8 Aircraft ID characters	fid[[8]= 8]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
65	Fix Pair Scratch Pad	fixpair_scratpad[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
66	Fix Pair Scratch Pad	fixpair_scratpad[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
67	ECID (ddA)	if_ecid[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
68	ECID (ddA)	if_ecid[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
69	TCID of other ARTS site	if_tcid[[3]=1]	ASCII	N/A	'0'-'9'	N/A	N
70	TCID of other ARTS site	if_tcid[[3]= 3]	ASCII	N/A	'0'-'9'	N/A	N
71	Keyboard symbol	kybdsymb	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
72	Satellite airport symbol	sat_apt	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N

73	Scratch Pad 1 Characters	scratch_pad[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
74	Scratch Pad 1 Characters	scratch_pad[[3]=3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
75	Scratch Pad 2 Characters	scratch_pad2[[3]=1]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
76	Scratch Pad 2 Characters	scratch_pad2[[3]= 3]	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
77	Site adapted alpha character	sitechar	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	N
78	Tabular line identifier	tablinid	ASCII	N/A	'A'-'Z' '0'-'9'	N/A	Y
79	VFR FP Tab Line Identifier	vfrfp_linid	ASCII	N/A	'0'-'9' space	N/A	N
80	Auto-acquire flag	aa	Boolean	N/A	0..1	N/A	N
81	Assigned Altitude flag	asng_alt	Boolean	N/A	0..1	N/A	N
82	BRITE eligibility indicator	brite_eligib	Boolean	N/A	0..1	N/A	N
83	Inhibit CA single trk ind	cai_inh_proc	Boolean	N/A	0..1	N/A	N
84	Inhibt CA ind for trk pair	cai_pair	Boolean	N/A	0..1	N/A	N
85	VFR beacon code inhib indicator	cai_vfr_rbc	Boolean	N/A	0..1	N/A	N
86	CA inhibit zone suppress	cai_zone_sup	Boolean	N/A	0..1	N/A	N
87	Scratchpad change for CTAS	chg_scratpad	Boolean	N/A	0..1	N/A	N
88	CA alert display indicator	disp_ca	Boolean	N/A	0..1	N/A	N
89	MSAW Climb indicator	disp_climb	Boolean	N/A	0..1	N/A	N
90	Display DB indicator	disp_db	Boolean	N/A	0..1	N/A	N
91	Display DM indicator	disp_dm	Boolean	N/A	0..1	N/A	N
92	Display/retain FDB indicator	disp_fdb	Boolean	N/A	0..1	N/A	N
93	Display blinking FP indicator	disp_fp	Boolean	N/A	0..1	N/A	N
94	Display blinking IF indicator	disp_if	Boolean	N/A	0..1	N/A	N
95	MSAW warning indictor	disp_la	Boolean	N/A	0..1	N/A	N
96	Display interfacility NAT ind	disp_nat	Boolean	N/A	0..1	N/A	N
97	Display OLD indicator	disp_old	Boolean	N/A	0..1	N/A	N
98	Display Pointout indicator	disp_po	Boolean	N/A	0..1	N/A	N
99	Emer/radio fail/hijack indicator	em	Boolean	N/A	0..1	N/A	N
100	Exit Fix is Primary Airport ind	exitfix_is_pri_apt	Boolean	N/A	0..1	N/A	N
101	Flashing ABC indicator	flash_abc	Boolean	N/A	0..1	N/A	N
102	Forced control change	force_ctl_chg	Boolean	N/A	0..1	N/A	N
103	Freeze full data block indicator	frz_fdb	Boolean	N/A	0..1	N/A	N
104	Global leader dir ind F7 L dd	global_ldr	Boolean	N/A	0..1	N/A	N
105	Heavy aircraft indicator	heavy	Boolean	N/A	0..1	N/A	N
106	Interfacility handoff complete	ho_comp	Boolean	N/A	0..1	N/A	N
107	Inhibit auto acquisition	iaa	Boolean	N/A	0..1	N/A	N
108	Interfacility late hand-off ind	iaf_lho	Boolean	N/A	0..1	N/A	N
109	IF ARSA Indicator	if_arsa	Boolean	N/A	0..1	N/A	N

110	IF AHO inhibited (delta) flag	if_delta	Boolean	N/A	0..1	N/A	N
111	IF late handoff indicator	if_lho	Boolean	N/A	0..1	N/A	N
112	Inhibit a/c type indicatr	inhactyp	Boolean	N/A	0..1	N/A	N
113	Inhibit Mode C altitude	inhmodec	Boolean	N/A	0..1	N/A	N
114	Inhibit AMB indicator	inh_amb	Boolean	N/A	0..1	N/A	N
115	Inhibit blinking HO	inh_bho	Boolean	N/A	0..1	N/A	N
116	Inhibit auto-handoff	inh_ifaho	Boolean	N/A	0..1	N/A	N
117	Display intrafacility NAT ind	intra_nat	Boolean	N/A	0..1	N/A	N
118	MSAW alert display indicator	lai_inh_disp	Boolean	N/A	0..1	N/A	N
119	Inhibit MSAW processing ind	lai_inh_proc	Boolean	N/A	0..1	N/A	N
120	Leader Direction Change Request	ldr_dir_chg	Boolean	N/A	0..1	N/A	N
121	Out of range indicator	outofrng	Boolean	N/A	0..1	N/A	N
122	Radar only flight plan indicator	rdr_only	Boolean	N/A	0..1	N/A	N
123	Ring remote MSAW alarm	remote_alarm	Boolean	N/A	0..1	N/A	N
124	MSAW alarm indicator	ring_msaw	Boolean	N/A	0..1	N/A	N
125	Satellite List Entry	sat_list_entry	Boolean	N/A	0..1	N/A	N
126	Suspend out-of-range indicator	sdor	Boolean	N/A	0..1	N/A	N
127	Track active status	status_a	Boolean	N/A	0..1	N/A	N
128	Suspend trk trk/not trk	susp_trk_not_trk	Boolean	N/A	0..1	N/A	N
129	Suspend track special symbol	sus_trk_sym	Boolean	N/A	0..1	N/A	N
130	TA beacon code received	taval	Boolean	N/A	0..1	N/A	N
131	TI beacon code received	tival	Boolean	N/A	0..1	N/A	N
132	Live/training track indicator	tng	Boolean	N/A	0..1	N/A	N
133	VFR Fix intermediate flag	vfrfp_fixint	Boolean	N/A	0..1	N/A	N
134	VFR fp originated at ARTS	vfr_arts	Boolean	N/A	0..1	N/A	N
135	VFR flight plan	vfr_fp	Boolean	N/A	0..1	N/A	N

Table 22.3.5.4.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Flight Plan Maintenance Msg code	Message Code = 1383	uns16	1	31-16
2	Flight Plan Maintenance Msg length	Message Length = 228 bytes	uns16	1	15-0
3	Assigned beacon code		uns16	2	31-16
4	Active controller		uns16	2	15-0
5	Auto-handoff altitude		uns16	3	31-16
6	Track requested altitude		int16	3	15-0
7	Flight Plan assigned altitude		int16	4	31-16
8	ETA/PTD in minutes since midnight		uns16	4	15-0
9	FDF Number		uns16	5	31-16
10	Directed Handoff controller		uns16	5	15-0
11	IF message number		uns16	6	31-16
12	IF message time delta	(seconds)	uns16	6	15-0
13	IF TU time delta	(seconds)	uns16	7	31-16
14	Old Primary Controller		uns16	7	15-0
15	Primary controller		uns16	8	31-16
16	Run Down List		uns16	8	15-0
17	Satellite List Azimuth	from airport	uns16	9	31-16
18	Satellite List Range	from airport	uns16	9	15-0
19	TCID		uns16	10	31-16
20	TI/TA beacon code		uns16	10	15-0
21	Track number (per sensor)	This field is repeated [[MAX_SENSQ] =1] times	uns16	11	31-16
22	Track number (per sensor)	This field is repeated [[MAX_SENSQ] =15] times	uns16	18	31-16
23	Sensor link/no link indicator	These [Fields = 2] are repeated [[MAX_SENSQ] =1] times	boolean	18	15-8
24	Sensor real/pseudo link indicator		boolean	18	7-0
25	Sensor link/no link indicator	These [Fields = 2] are repeated [[MAX_SENSQ] = 15] times	boolean	25	15-8
26	Sensor real/pseudo link indicator		boolean	25	7-0
27	Assigned beacon code status	ABC_EXISTS(0)=assigned TENT_ABC(1)=tentative assigned NO_ABC(2)=no assigned	uns8	26	31-24
28	ACID number of non-space chars		uns8	26	23-16
29	Aircraft category		uns8	26	15-8
30	Original Aircraft category		uns8	26	7-0
31	Arrival/Departure/Enroute status	Must be ADE_OVERFLIGHT or ADE_ARR_UNKNOWN..ADE_ARRU or ADE_DEP_UNKNOWN..ADEPU	uns8	27	31-24
32	Auto-handoff index		int8	27	23-16
33	Adjacent ARTS ID		uns8	27	15-8
34	Aircraft type disp counter		uns8	27	7-0
35	Flight plan adaptor		uns8	28	31-24

	number				
36	FP status controlled VFR flight	0 = IFR1 = VFR2 = VFR_ON_TOP	uns8	28	23-16
37	Handoff Countdown		uns8	28	15-8
38	Handoff status	0=not in handoff 1=intrafacility countdown 2=interfacility countdown 3=intrafacility 4=to ARTCC 5=from ARTCC	uns8	28	7-0
39	Count of DX messages received		uns8	29	31-24
40	Count of attempts to send a msg		uns8	29	23-16
41	ARTCC sector handing off to		uns8	29	15-8
42	ARTCC site messages are sent to		uns8	29	7-0
43	IF message status	See text	uns8	30	31-24
44	Keyboard subset		uns8	30	23-16
45	Leader direction from change req	LDR_N(0)=North LDR_NE(1)=Northeast LDR_E(2)=EastLDR_SE(3)=Southeast LDR_S(4)=South LDR_SW(5)=Southwest LDR_W(6)=WestLDR_NW(7)=Northwest	uns8	30	15-8
46	Active radar subsystem		uns8	30	7-0
47	Track type	0=store 1=tab coast 2=suspend not tracking 3=suspend	uns8	31	31-24
48	Track usage status	ASSOCIATED(1)=associated UNASSOCIATED(3)=unassociated	uns8	31	23-16
49	Tab coast out-of-range tracks	0=not OR 2=OR 3=blinking OR	uns8	31	15-8
50	Display number for VFR list		uns8	31	7-0
51	VFR fp stat	0=VFR 1=FIX 2=IFP	uns8	32	31-24
52	4 Aircraft type characters		char	32	23-16
53	4 Aircraft type characters		char	33	31-24
54	Track assigned altitude		char	33	23-16
55	Track assigned altitude		char	34	31-24
56	Symbol and Subset of ART-ART UHO		char	34	23-16
57	Symbol and Subset of ART-ART UHO		char	34	15-8
58	ARTS to ARTS symbol		char	34	7-0
59	Airport and SS entry fixes		char	35	31-24
60	Airport and SS entry fixes		char	35	7-0
61	Airport and SS exit fixes		char	36	31-24
62	Airport and SS exit fixes		char	36	7-0
63	8 Aircraft ID characters		char	37	31-24
64	8 Aircraft ID characters		char	38	7-0
65	Fix Pair Scratch Pad		char	39	31-24
66	Fix Pair Scratch Pad		char	39	15-8
67	ECID (ddA)		char	39	7-0

68	ECID (ddA)		char	40	23-16
69	TCID of other ARTS site		char	40	15-8
70	TCID of other ARTS site		char	41	31-24
71	Keyboard symbol		char	41	23-16
72	Satellite airport symbol		char	41	15-8
73	Scratch Pad 1 Characters		char	41	7-0
74	Scratch Pad 1 Characters		char	42	23-16
75	Scratch Pad 2 Characters		char	42	15-8
76	Scratch Pad 2 Characters		char	43	31-24
77	Site adapted alpha character		char	43	23-16
78	Tabular line identifier		char	43	15-8
79	VFR FP Tab Line Identifier		char	43	7-0
80	Auto-acquire flag		boolean	44	31-24
81	Assigned Altitude flag		boolean	44	23-16
82	BRITE eligibility indicator		boolean	44	15-8
83	Inhibit CA single trk ind		boolean	44	7-0
84	Inhibt CA ind for trk pair		boolean	45	31-24
85	VFR beacon code inhib indicator		boolean	45	23-16
86	CA inhibit zone suppress		boolean	45	15-8
87	Scratchpad change for CTAS		boolean	45	7-0
88	CA alert display indicator		boolean	46	31-24
89	MSAW Climb indicator		boolean	46	23-16
90	Display DB indicator		boolean	46	15-8
91	Display DM indicator		boolean	46	7-0
92	Display/retain FDB indicator		boolean	47	31-24
93	Display blinking FP indicator		boolean	47	23-16
94	Display blinking IF indicator		boolean	47	15-8
95	MSAW warning indictor		boolean	47	7-0
96	Display interfacility NAT ind		boolean	48	31-24
97	Display OLD indicator		boolean	48	23-16
98	Display Pointout indicator		boolean	48	15-8
99	Emer/radio fail/hijack indicator		boolean	48	7-0
100	Exit Fix is Primary Airport ind		boolean	49	31-24
101	Flashing ABC indicator		boolean	49	23-16
102	Forced control change		boolean	49	15-8
103	Freeze full data block indicator		boolean	49	7-0
104	Global leader dir ind F7 L dd		boolean	50	31-24
105	Heavy aircraft indicator		boolean	50	23-16
106	Interfacility handoff complete		boolean	50	15-8

107	Inhibit auto acquisition		boolean	50	7-0
108	Interfacility late hand-off ind		boolean	51	31-24
109	IF ARSA Indicator		boolean	51	23-16
110	IF AHO inhibited (delta) flag		boolean	51	15-8
111	IF late handoff indicator		boolean	51	7-0
112	Inhibit a/c type indicatr		boolean	52	31-24
113	Inhibit Mode C altitude		boolean	52	23-16
114	Inhibit AMB indicator		boolean	52	15-8
115	Inhibit blinking HO		boolean	52	7-0
116	Inhibit auto-handoff		boolean	53	31-24
117	Display intrafacility NAT ind		boolean	53	23-16
118	MSAW alert display indicator		boolean	53	15-8
119	Inhibit MSAW processing ind		boolean	53	7-0
120	Leader Direction Change Request		boolean	54	31-24
121	Out of range indicator		boolean	54	23-16
122	Radar only flight plan indicator		boolean	54	15-8
123	Ring remote MSAW alarm		boolean	54	7-0
124	MSAW alarm indicator		boolean	55	31-24
125	Satellite List Entry		boolean	55	23-16
126	Suspend out-of-range indicator		boolean	55	15-8
127	Track active status		boolean	55	7-0
128	Suspend trk trk/not trk		boolean	56	31-24
129	Suspend track special symbol		boolean	56	23-16
130	TA beacon code received		boolean	56	15-8
131	TI beacon code received		boolean	56	7-0
132	Live/training track indicator		boolean	57	31-24
133	VFR Fix intermediate flag		boolean	57	23-16
134	VFR fp originated at ARTS		boolean	57	15-8
135	VFR flight plan		boolean	57	7-0

22.3.5.5 PRM Heartbeat Msg (m_prm_fast_hbeat)

External form of the AGW Heartbeat Msg (1301). This submessage is sent by the PRM CSCI once per second. It contains the PRM process state and the current system time. The PRM State contains one of the following values:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

Table 22.3.5.5.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	Current System Time within day	system_time	Int	msec	0..86399999	1	Y
4	Day of Year	day_of_year	Int	N/A	1..366	N/A	Y
5	Four digits - year	year	Int	N/A	1970..2037	N/A	Y
6	FAST State (see text)	fast_state	Enum	N/A	0..3	N/A	N
7	Pad msg to multiple of 32 bits	pad[3]	char	N/A	N/A	N/A	N

Table 22.3.5.5.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1384	uns16	1	31-16
2	Submessage length	Message Length = 16 bytes	uns16	1	15-0
3	Current System Time within day		uns32	2	31-0
4	Day of Year		uns16	3	31-16
5	Four digits - year		uns16	3	15-0
6	CTIS State (see text)		uns8	4	31-24
7	Pad msg to multiple of 32 bits		uns8	4	23-0

22.3.5.6 PRM Adaptation Msg for PRM (m_prm_adapt)

This submessage is sent to the PRM system only on PRM transition to Active state. The message transfers Lat/Long System Plane and Sensor coordinates along with useful adaptation data.

Table 22.3.5.6.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
3	Sensor Range	sensor_range[MAX_SENSQ]	Float	NM	30..256	.01	N
4	Scan Time for Each Sensor	scanq[MAX_SENSQ]	Float	seconds	2..14	.01	N
5	RTQC Station Altitude	sensor_alt[MAX_SENSQ]	Float	feet	-1000..10000	1	N
6	Radius of the conformal sphere in NM	sc_conf_radius	Float	NM	3300..3600	.01	N
7	Conformal Latitude of Tangency Point	sc_tan_co_lat	Float				N
8	Longitude of Tangency Point	sc_tan_lon	Float	radians	0..PI	.01	N
9	Stereographic Origin X-Offset	sc_xt	Float	NM	0..500	.01	N
10	Stereographic Origin Y-Offset	sc_yt	Float	NM	0..500	.01	N
11	Maximum System X Coordinate	sc_max_sys_x	Float	NM	0..1100	.01	N
12	Maximum System Y Coordinate	sc_max_sys_y	Float	NM	0..1100	.01	N
13	Minimum System X Coordinate	sc_min_sys_x	Float	NM	0..0	.01	N
14	Minimum System Y Coordinate	sc_min_sys_y	Float	NM	0..0	.01	N
15	Sensor System X Coordinate	sc_sensor_sys_x[MAX_SENSQ]	Float	NM	0..1100	.01	N
16	Sensor System Y Coordinate	sc_sensor_sys_y[MAX_SENSQ]	Float	NM	0..1100	.01	N
17	Sine of Physical to True North Rotation Angle	sine_phys_to_true[MAX_SENSQ]	Float	radians	-1..1	.00001	N
18	Sine of Rotation Angle from True to Magnetic North	sine_true_to_mag[MAX_SENSQ]	Float	radians	-1..1	.00001	N
19	Type of Sensor (ASR/ARSR)	sensor_type[MAX_SENSQ]	Int	N/A		N/A	N
20	Single Character Sensor ID	sensor_char[MAX_SENSQ][2]	ASCII	N/A	1..1	N/A	N
21	Site ID Characters	site_id[4]	ASCII	N/A	3..3	N/A	N
22	Long Name for each Sensor	sensor_lname[MAX_SENSQ][40]	ASCII	N/A	1..39	N/A	N
23	Short 3 Character Sensor Names	sensor_abbr[MAX_SENSQ][4]	ASCII	N/A	3..3	N/A	N

24	32-bit boundary pad	pad1[3]	char	N/A	N/A	N/A	N

Table 22.3.5.6.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1386	uns16	1	31-16
2	Submessage length	Message Length = 1172 bytes	uns16	1	15-0
3	Sensor Range	1 32bit word for each of 15 sensors	realf	2	31-0
4	Scan Time for Each Sensor	1 32bit word for each of 15 sensors	realf	17	31-0
5	RTQC Station Altitude	1 32bit word for each of 15 sensors	realf	32	31-0
6	Radius of the conformal sphere in NM		realf	47	31-0
7	Conformal Latitude of Tangency Point		realf	48	31-0
8	Longitude of Tangency Point		realf	49	31-0
9	Stereographic Origin X-Offset		realf	50	31-0
10	Stereographic Origin Y-Offset		realf	51	31-0
11	Maximum System X Coordinate		realf	52	31-0
12	Maximum System Y Coordinate		realf	53	31-0
13	Minimum System X Coordinate	This value is always set to 0 for Common ARTS A6.05/A2.09	realf	54	31-0
14	Minimum System Y Coordinate	This value is always set to 0 for Common ARTS A6.05/A2.09	realf	55	31-0
15	Sensor System X Coordinate	1 32bit word for each of 15 sensors	realf	56	31-0
16	Sensor System Y Coordinate	1 32bit word for each of 15 sensors	realf	71	31-0
17	Sine of Physical to True North Rotation Angle		realf	86	31-0
18	Sine of Rotation Angle from True to Magnetic North		realf	101	31-0
19	Type of Sensor (ASR/ARSR)	ASR = 0, ARSR = 1 1 8bit word for each of 15 sensors	uns8	116	31-0
20	Single Character Sensor ID	Single char field followed by NULL for each of 15 sensors	char	119	7-0
21	Site ID Characters		char	127	23-16
22	Long Name for each Sensor	39 char fields followed by NULL for each of 15 sensors	char	128	23-16
23	Short 3 Character Sensor Names	3 char fields followed by NULL for each of 15 sensors	char	277	23-16
24	32-bit pad	3 8bit pads to have messages on 32bit boundary	char	292	23-16

22.3.5.7 PRM CA Conflict Pairs Msg for PRM (m_prm_cap)

External form of the CA Conflict Pairs Msg (1801). This submessage is sent from the CP whenever a conflict pair status changes and once per scan. This message can be multiple segment when the number of conflicts requires more than the maximum length. The minumum message (with No Conflicts) consists of 8 bytes with a first index of 0 and last index of CA_CNTBLQ-1. A Mode C Intruder conflict consists of a set of entries with the same track number 1 (FDF number) and Conflict Alert Table index with different MCI tracks (ADF number) and corresponding MCI sensor number.

Table 22.3.5.7.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	MDFPL	1	Y
3	First Index	first_index	Int	N/A	0..CA_CNTBLQ - 1	N/A	Y
4	Last Index	last_index	Int	N/A	0..CA_CNTBLQ - 1	N/A	Y
5	CA track 1	trk_nbr_1	Int	N/A	1..MAX_FDFQ	N/A	Y
6	CA track 2	trk_nbr_2	Int	N/A	1..MAX_FDFQ	N/A	Y
7	CA track 2 MCI sensor number	mci_sensor	Int	N/A	0..MAX_SENSQ-1	1	Y
8	MCI Track Indicator	mci_track	Boolean	N/A	0..1	N/A	N
9	Conflict Alert Table Index	ca_table_ix	Int	N/A	0..CA_CNTBLQ - 1	N/A	Y
10	Display CA flag	disp_ca	Boolean	N/A	0..1	N/A	N
11	Ring CA alarm flag	ring_alarm	Boolean	N/A	0..1	N/A	N
12	Ring remote CA alarm flag	remote_alarm	Boolean	N/A	0..1	N/A	N
13	Spare	pad1[2]	Int	N/A	N/A	N/A	N

Table 22.3.5.7.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1389	uns16	1	31-16
2	Submessage length	Message Length = (20 bytes + 12 bytes per additional CA pair)	uns16	1	15-0
3	First Index		uns16	2	31-16
4	Last Index		uns16	2	15-0
5	CA track 1	Fields 5-13 repeated over again if more than 1 pair in CA	uns16	3	31-16
6	CA track 2	Fields 5-13 repeated over again if more than 1 pair in CA	uns16	3	15-0
7	CA track 2 MCI sensor number	Fields 5-13 repeated over again if more than 1 pair in CA	uns8	4	31-24
8	MCI Track Indicator	Fields 5-13 repeated over again if more than 1 pair in CA	Boolean	4	23-16
9	Conflict Alert Table Index	Fields 5-13 repeated over again if more than 1 pair in CA	uns8	4	15-8
10	Display CA flag	Fields 5-13 repeated over again if more than 1 pair in CA	Boolean	4	7-0
11	Ring CA alarm flag	Fields 5-13 repeated over again if more than 1 pair in CA	Boolean	5	31-24
12	Ring remote CA alarm flag	Fields 5-13 repeated over again if more than 1 pair in CA	Boolean	5	23-16
13	Spare	Fields 5-13 repeated over again if more than 1 pair in CA	uns8	5	15-0

22.3.5.8 PRM PC Heartbeat Msg (m_prm_hbeat)

This submessage is sent to the AGW once per second by the PRM PC. The CTIS CSCI will process this message to determine the presence of the Noise Monitor PC and the condition of the interconnecting network link.

The PRM State field contains one of the following values representing the state of the PRM PC:

0 = Active

1 = Standby

2 = Offline

3 = Idle.

Table 22.3.5.8.1 Message Field Data

Field	Field Name	SW Name	REP	Units	Range	Accuracy	Check
1	Submessage code	code	Int	code	0..xFFFF	N/A	Y
2	Submessage length	lgth	Int	Bytes	4..MAXSUBMSGL	1	Y
3	PRM State (see text)	prm_state	Enum	N/A	0..3	N/A	N
4	Pad msg to multiple of 32 bits	pad[3]	char	N/A	N/A	N/A	N

Table 22.3.5.8.2 Message Type/Word Definition

Field	Field Name	Comment	Type	Word	Bits
1	Submessage code	Message Code = 1385	uns16	1	31-16
2	Submessage length	Message Length = 8 bytes	uns16	1	15-0
3	PRM State (see text)		uns8	2	31-24
4	Pad msg to multiple of 32 bits		uns8	2	23-0